Final
Site-Specific Field Sampling Plan, Site-Specific Safety and Health Plan, and Site-Specific Unexploded Ordnance Safety Plan Attachments, Range 29, Former Weapons Demonstration Range, Parcel 87Q-X, Former Rifle Ranges, Parcels 110Q and 111Q, and Former Impact Area, Parcel 239Q-X

Fort McClellan
Calhoun County, Alabama

Task Order CK10
Contract No. DACA21-96-D-0018
IT Project No. 796887

November 2000

Final
Site-Specific Field Sampling Plan Attachment
Range 29, Former Weapons Demonstration Range, Parcel 87Q-X, Former Rifle Ranges, Parcels 110Q and 111Q, and Former Impact Area, Parcel 239Q-X

Fort McClellan
Calhoun County, Alabama

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Revision 1

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Executive Summary

In accordance with Contract Number DACA21-96-D-0018, Delivery Order CK10, IT Corporation (IT) will conduct site investigation activities at Range 29, Weapons Demonstration Range, Parcel 87Q-X, Former Rifle Ranges, Parcels 110Q and 111Q, and Impact Area, Parcel 239Q-X, at Fort McClellan (FTMC), Calhoun County, Alabama, to determine the presence or absence of potential site-specific chemicals at this site. The purpose of this site-specific field sampling plan is to provide technical guidance for sampling activities at these parcels.

Range 29, Former Weapons Demonstration Range, Parcel 87Q-X, covers 182 acres of land. Former Rifle Ranges, Parcels 110Q and 111Q, and Impact Area, Parcel 239Q-X, all fall within the parcel boundaries of Range 29, Parcel 87Q-X; herefore, the area that comprises all four sites will be referenced as Range 29 throughout the text.

Range 29 is located in the southeastern portion of Central Main Post. Range 29 is south of Fifth Avenue, due west of Holloway Hill, and bordered to the east by Rocky Hollow Road. Range 29, Former Weapons Demonstration Range, Parcel 87Q-X, has been in use from pre-1940 until recently. Ordnance known to be used at this range since 1977 include small arms (pistol and machine gun 9 millimeter through 7.62 millimeter), demolition materials (C4 and trinitrotoluene charges), antitank rockets (M72LAW), and ammunition for M203 grenade launchers. Dates and types of ordnance prior to 1977 are unknown. Parcels 110Q and 111Q are Former Rifle Ranges. The date and type of ordnance fired at the Former Rifle Ranges are unknown; however, it is probable that small caliber arms were used here. These ranges appear on the FTMC archive search report Plate 5: World War II to 1950 map, and are identified as rifle ranges. These ranges also appear on a 1959 Army Service Map. Former Impact Area, Parcel 239Q-X, is located in the western portion of Range 29. It was interpreted as an impact area on the 1949 Environmental Photographic Information Center aerial photo composite.

Specifically, IT will collect 30 surface soil samples, 30 subsurface soil samples, 20 groundwater samples, 8 surface water samples, and 8 sediment samples at Range 29 to meet the objectives of the site investigation. Potential contaminant sources at Range 29 include lead, nitroexplosives, and solid rocket propellant. Chemical analyses of the samples collected during the field program will include nitroexplosives, perchlorate, and metals. A full suite of analytes will be collected at two sample locations: one downgradient of the potential fill area and the other within the boundaries of the potential fill area. The chemical analyses for these locations will include volatiles, semivolatiles, chlorinated pesticides, polyaromatic hydrocarbons, organophosphorus

pesticides, chlorinated herbicides, metals, perchlorate, and nitroexplosives. Results from these analyses will be compared with site-specific screening levels developed in the IT 2000, *Final Human Health and Ecolocical Screening Values and PAH Background Summary Report*, and regulatory agency guidelines.

Range 29 falls within the "Possible Artillery Impact Areas in Central Main Post" shown on Plate 10 of the FTMC Archive Search Report Maps, July, 1999; therefore, unexploded ordnance (UXO) surface sweeps and downhole surveys of soil borings will be required to support field activities. The surface sweeps and downhole surveys will be conducted to identify anomalies for the purposes of UXO avoidance.

This site-specific field sampling plan attachment to the installation-wide sampling and analysis plan (SAP) for Range 29 will be used in conjunction with the site-specific safety and health plan, site-specific UXO safety plan, the installation-wide work plan, and the SAP. The SAP includes the installation-wide safety and health plan, waste management plan, ordnance and explosives management plan, and quality assurance plan. Site-specific hazard analyses are included in the site-specific safety and health plan and site-specific UXO safety plan.

1.0 Project Description

1.1 Introduction

The U.S. Army is conducting studies of the environmental impact of suspected contaminants at Fort McClellan (FTMC) in Calhoun County, Alabama, under the management of the U.S. Army Corps of Engineers (USACE)-Mobile District. The USACE has contracted IT Corporation (IT) to provide environmental services for the site investigation (SI) of Range 29, Weapons Demonstration Range, Parcel 87Q-X, Former Rifle Ranges, Parcels 110Q and 111Q, and Impact Area, Parcel 239Q-X, under Delivery Order CK10, Contract Number DACA21-96-D-0018.

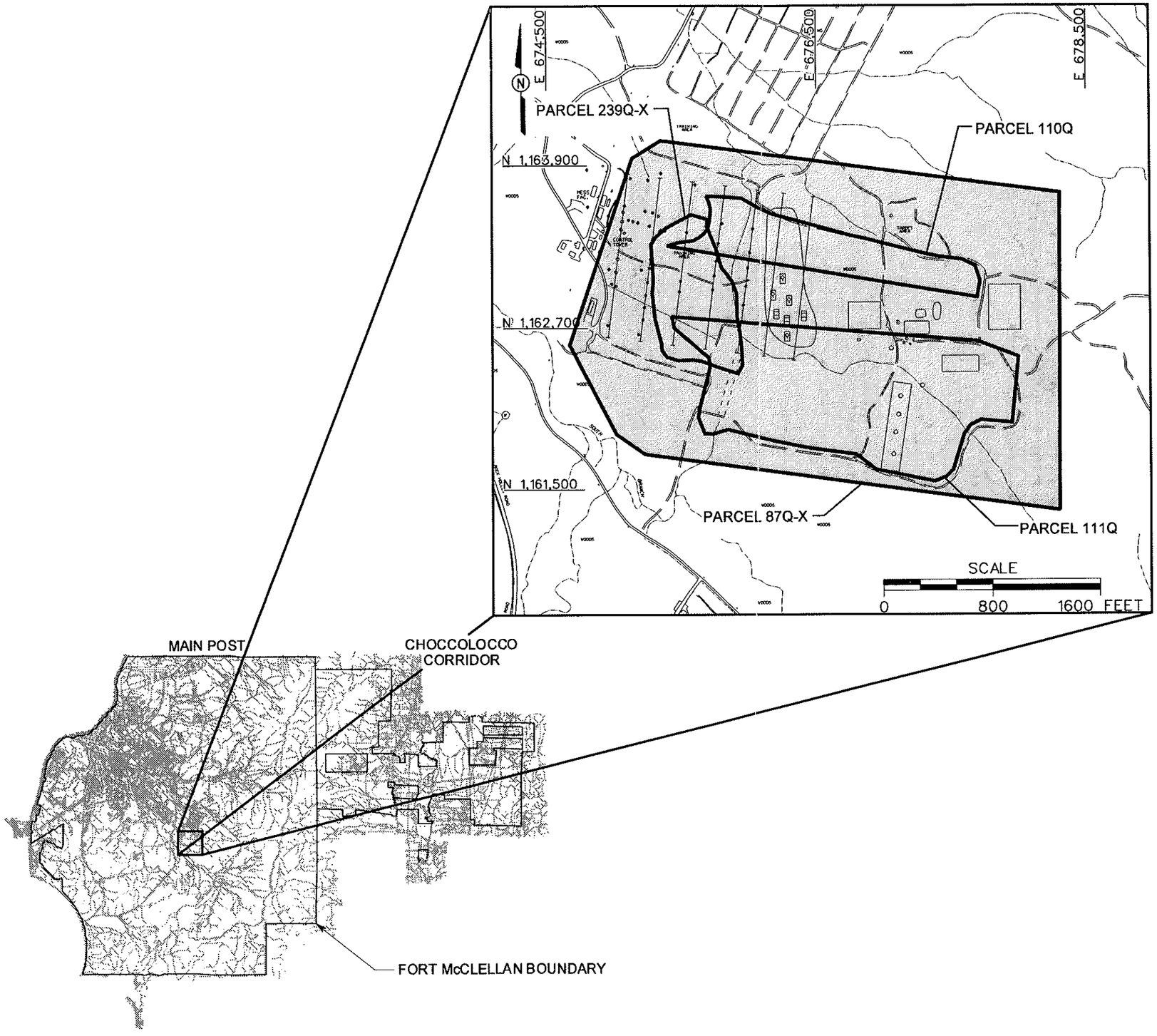
Range 29, Former Weapons Demonstration Range, Parcel 87Q-X, covers 182 acres of land. Former Rifle Ranges, Parcels 110Q and 111Q, and Impact Area, Parcel 239Q-X, all fall within the parcel boundaries of Range 29, Parcel 87Q-X (Figure 1-1); therefore, the area that comprises all four sites will be referenced as Range 29 throughout the text.

This site-specific field sampling plan (SFSP) attachment to the installation-wide sampling and analysis plan (SAP) (IT, 2000a) for FTMC has been prepared to provide technical guidance for sample collection and analysis at Range 29. This SFSP will be used in conjunction with the site-specific safety and health plan (SSHP) and site-specific unexploded ordnance (UXO) safety plan developed for Range 29, and the installation-wide work plan (WP) (IT, 1998) and SAP. The SAP includes the installation-wide safety and health plan, waste management plan, ordnance and explosives management plan, and quality assurance plan (QAP). Site-specific hazard analyses are included in the SSHP and site-specific UXO safety plan.

1.2 Site Description

The focus of the investigation at Range 29 is based on information collected by IT during site visits completed in March and April, 2000. Range 29 is located in the southeastern portion of central Main Post. It is south of Fifth Avenue, due west of Holloway Hill, and bordered to the east by Rocky Hollow Road (Figure 1-2).

Physical features of Range 29 include two intermittent streams that originate on the site but leave the site, one flows to the north and the other flows to the south into South Branch Cane Creek. Topographic ridges, including Holloway Hill, border the site to the east and southeast, with elevations reaching 1,150 feet. The eastern half of Range 29 is wooded while the western half remains mostly barren with sparse trees and grass. Vehicular access is easily obtained to Range 29.



LEGEND

- UNIMPROVED ROADS AND PARKING
- PAVED ROADS AND PARKING
- BUILDING
- TREES / TREELINE
- PARCEL BOUNDARY
- BRIDGE
- CULVERT WITH HEADWALL
- SURFACE DRAINAGE / CREEK
- UTILITY POLE

FIGURE 1-1
SITE LOCATION MAP
SITE INVESTIGATION AT RANGE 29
FORMER WEAPONS DEMONSTRATION RANGE, PARCEL 87Q-X
FORMER RIFLE RANGES
PARCELS 110Q AND 111Q AND
FORMER IMPACT AREA
PARCEL 239Q-X

U. S. ARMY CORPS OF ENGINEERS
MOBILE DISTRICT
FORT McCLELLAN
CALHOUN COUNTY, ALABAMA
Contract No. DACA21-96-D-0018

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INITIATOR: J. BROWN
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E 674,500
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TARGET AREA
FLOW DIRECTION
FORMER TRASH STORAGE
16 LANES WITH FOXHOLES AND SAND BAGS
FORMER LATRINES
FORMER MESS AND WEAPONS CLEANING AREA
FORMER BREAK AREA
FORMER RANGE SHACK
FORMER CONTROL TOWER
FORMER PITS FOR POSITION
FORMER BLEACHERS
FORMER LATRINES
FIRING POINTS
ORDNANCE IMPACT AREA
WOODS
TARGET AREA
PARCEL 110Q
15.3 acres
TRENCHES AND MOUNDS
TARGET (TANKS AND JEEPS)
FILL AREA
SHACK
BULLET IMPACT AREA
NUMEROUS MOUNDS
SHACK
CIRCULAR BERMS 30' IN DIAMETER FILLED WITH WATER
DEBRIS PILES AND TRASH DUMPSTER
AREA OF EARTHEN TARGET HOUSES
PARCEL 239Q-X
13 acres
BERM (POTENTIAL FIRING LINE)
WOODS
FLOW DIRECTION
FLOW DIRECTION
FLOW DIRECTION
ROCKY HOLLOW ROAD
SOUTH BRANCH CANE CREEK
PARCEL 111Q
46.5 acres
PARCEL 87Q-X
182 acres
0m 50m 100m 150m 200m 250m 300m

LEGEND

- UNIMPROVED ROADS AND PARKING
- PAVED ROADS AND PARKING
- REMOVED BUILDINGS
- TOPOGRAPHIC CONTOURS (CONTOUR INTERVAL - 5 FOOT)
- TREES / TREELINE
- PARCEL BOUNDARY
- BRIDGE
- CULVERT WITH HEADWALL
- SURFACE DRAINAGE / CULVERT
- UTILITY POLE
- MOUNDS
- CONCRETE PAD FOR FORMER POP-UP TARGETS
- IMPACT AREA

SCALE
0 400 800 FEET

FIGURE 1-2
SITE MAP
SITE INVESTIGATION AT RANGE 29
FORMER WEAPONS DEMONSTRATION RANGE, PARCEL 87Q-X
FORMER RIFLE RANGES
PARCELS 110Q AND 111Q AND
FORMER IMPACT AREA
PARCEL 239Q-X

U. S. ARMY CORPS OF ENGINEERS
MOBILE DISTRICT
FORT McCLELLAN
CALHOUN COUNTY, ALABAMA
Contract No. DACA21-96-D-0018

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Range 29, Former Weapons Demonstration Range, Parcel 87Q-X, is approximately 3,600 feet long (east to west) by 2,200 feet wide (north to south), and covers approximately 182 acres. The range has been in use from pre-1940 until recently. Ordnance known to be used at this range since 1977 include small arms (pistol and machine gun 7.62 millimeter through 9 millimeter), demolition materials (C4 and trinitrotoluene charges), antitank rockets (M72LAW) and ammunition for M203 grenade launchers. Dates and types of ordnance prior to 1977 are unknown (Environmental Science and Engineering, Inc. [ESE], 1998). The buildings, towers, other structures, along with the mechanical pop-up targets at Range 29, have been removed. Structures still visible are gravel parking and training areas, as well as the concrete pads that were the foundations for the mechanical targets. Earthen mounds, approximately 4 feet in height, used as firing points, also exist at the western boundary of the parcel. There were 16 firing lanes with foxholes and sandbags used at Range 29 as mentioned in FTMC, Regulation No. 350-2. Other features still present at Range 29 include target tanks and jeeps at the 250-meter firing line as well as a culvert that extends approximately 800 feet from east to west separating the northern and southern section of the western portion of Range 29. Range 29 was observed to contain much UXO that included a highly explosive antitank rocket, as reported to FTMC authorities by IT UXO personnel. The heavily wooded, down-range area presents a particular hazard due to abundant UXO at the site.

During the site walk-over completed by IT personnel at Range 29, Former Weapons Demonstration Range, Parcel 87Q-X, several anomalies were noticed. The concrete pads used for mechanical target are evenly spaced along the 50, 100, 150, 200, and 250 meter firing lines. An ordnance impact area was observed just behind the mechanical target pads, at the 250 to 300 meter firing lines. Jeeps and tanks present at the 250-meter firing line were heavily impacted by ordnance. Types of ordnance observed are small caliber bullets, M203 40 millimeter grenade launcher rounds, and 3-inch mortar rounds. A fill area with reinforced concrete, brick, and other types of construction debris was located at the center of the site. Numerous mounds are located just east of this area along with a 55-gallon drum. This area appears to be a former fill area, however, the depth of fill could not be determined by visual sighting. Some of the mounds are at least 4 feet high and are approximately 40 feet in length. Several piles of debris were located just across the road that runs east to west at the eastern end of Range 29. A trash dumpster was also located directly in center of the site along with two soil mounds. Due east of this area, towards the eastern parcel boundary, a bullet impact area was observed. A moderate quantity of small caliber (0.30 and 0.30-06 caliber) bullets were found in this area.

Parcels 110Q and 111Q are Former Rifle Ranges. The date and type of ordnance fired at the Former Rifle Ranges is unknown; however, it is assumed that small caliber arms were used here. These ranges appear on the FTMC Archive Search Report Plate 5: World War II to 1950 map, and are identified as rifle ranges (USACE, 1999a). These ranges also appear on a 1959 Army Service Map (ESE, 1998).

Former Rifle Range, Parcel 110Q, is approximately 2,100 feet in length and 300 feet wide. Parcel 110Q is located at the north portion of Range 29, and covers 15.3 acres. The bullet impact area located during the site walkover of Range 29 (east end of site) is probably associated with Former Rifle Range, Parcel 110Q.

Former Rifle Range, Parcel 111Q, is approximately 2,300 feet long and 900 feet wide. Parcel 111Q is located at the southern portion of Range 29, and covers 46.5 acres. Anomalies encountered during the site visit include two large circular berms at the northeast end of the parcel. Each circular berm was approximately 30 to 40 feet in diameter and filled with water. It is suspected that these could have been the mortar/artillery firing points. Earthen target houses were located at the center section of parcel. A shack was located north of the target houses. Two north/south berms were also located at this parcel. One berm was located approximately 150 feet west of the target houses. The berm located at the west end of the parcel is believed to have been the location for the firing line formerly used at this site.

Former Impact Area, Parcel 239Q-X, is located in the western portion of Range 29. Parcel 239Q-X was interpreted as an impact area on the 1949 Environmental Photographic Interpretation Center aerial photograph composite (ESE, 1998). Former Impact Area, Parcel 239Q-X, is approximately 1,100 feet long (north to south) and 600 feet wide (east to west), covering 13 acres. The firing point for this impact area could not be located.

The elevation of Range 29 varies from 890 feet to 1,100 feet (National Geodetic Vertical Datum of 1929). Surface water appears to drain to the northwest. Local shallow groundwater direction at the site is probably controlled by topography; therefore, groundwater direction in the residuum is likely to the northwest. Runoff water from the southwestern area of Range 29 discharges into South Branch of Cane Creek.

Soils at Range 29 consist of the Anniston and Allen series of soils. The Anniston and Allen Series of soils consists of strongly acidic, deep, well-drained soils that have developed in old, local alluvium. The parent material washed from the adjacent higher-lying Linker, Muskingum, Enders, and Montevallo soils, which developed from weathered sandstone, shale, and quartzite.

Sandstone and quartzite gravel and cobbles, as much as 8 inches in diameter, are on the surface and throughout the soil.

Soils on the western portion of Range 29 fall into the Anniston and Allen gravelly loams, 6 to 10 percent slopes, eroded (AcC2) (U.S. Department of Agriculture, 1961). Some severely eroded areas may be common on the surface for this soil type, as well as a few shallow gullies. The depth to bedrock ranges from 2 feet to greater than 10 feet. The typical soil description is 2 to 10 feet of well-drained stony loam to clay loam over stratified local alluvium, limestone, or shale bedrock. The depth to the water table is likely greater than 20 feet.

Soils on the eastern portion of Range 29 fall into the Anniston and Allen stony loams, 10 to 25 percent slopes (AdE) (U.S. Department of Agriculture, 1961). The surface soil of this mapping unit is very dark brown to very dark grayish-brown stony loam, 4 to 8 inches thick. Severely eroded areas are less common for this soil type. At a depth of about 10 inches, this material grades in a dark red, or dark reddish-brown stony fine sandy clay loam.

This mapping unit consists of friable soils that have developed in old alluvium on foot slopes and along the base of mountains. The color of the surface soil ranges from very dark brown and dark brown to reddish brown and dark reddish brown. The texture of subsoil ranges from light clay loam to clay or silty clay loam. The alluvium ranges in thickness from 2 to more than 8 feet. Infiltration and runoff are medium, permeability is moderate, and the capacity for available moisture is high. Organic matter is moderately low.

1.3 Scope of Work

The scope of work for activities associated with the SI at the Range 29 as specified by the statement of work (USACE, 1999b), includes the following tasks:

- Develop the SFSP attachment
- Develop the SSHP attachment
- Develop the site specific UXO safety plan attachment
- Conduct a surface and near-surface UXO survey over all areas to be included in the supplemental sampling effort
- Provide downhole UXO support for all intrusive drilling to determine buried downhole hazards

- Collect 30 surface soil samples, 30 subsurface soil samples, 20 groundwater samples, 8 surface water samples, and 8 sediment samples to determine whether potential site-specific chemicals (PSSC) are present at the Range 29 and to provide data useful for supporting any future planned corrective measures and closure activities.

Range 29 falls within the "Possible Explosive Ordnance Impact Areas" shown on Plate 10 of the FTMC Archive Search Report Maps, June, 1998; therefore, UXO surface sweeps and downhole surveys of soil borings will be required to support field activities at this site. The surface sweeps and downhole surveys will be conducted to identify anomalies for the purposes of UXO avoidance. The site-specific UXO safety plan attachment addresses the manner which the avoidance will be conducted.

At completion of the field activities and sample analyses (as listed in Section 4.5), draft and final SI summary reports will be prepared to evaluate the absence or presence of PSSCs at this site, and to recommend further actions, if appropriate. The SI summary report will be prepared in accordance with current U.S. Environmental Protection Agency (EPA), Region IV, and the Alabama Department of Environmental Management (ADEM) guidelines.

2.0 Summary of Existing Environmental Studies

An environmental baseline survey was conducted by ESE to document current environmental conditions of all FTMC property (ESE, 1998). The study was to identify sites that, based on available information, have no history of contamination and comply with U.S. Department of Defense guidance for fast-track cleanup at closing installations. The environmental baseline survey also provides a baseline picture of FTMC properties by identifying and categorizing the properties by seven criteria.

1. Areas where no storage, release, or disposal (including migration) has occurred
2. Areas where only release or disposal of petroleum products has occurred
3. Areas of contamination below action levels
4. Areas where all necessary remedial actions have been taken
5. Areas of known contamination with removal and/or remedial action underway
6. Areas of known contamination where required response actions have not been taken
7. Areas that are not evaluated or require further evaluation.

For non-Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) environmental or safety issues, the parcel label includes the following components: a unique non-CERCLA issue number, the letter "Q" designating the parcel as a Community Environmental Response Facilitation Act (CERFA) Category 1 Qualified Parcel, and the code for the specific non-CERCLA issue(s) present (ESE, 1998). The non-CERCLA issue codes used are:

A	=	Asbestos (in buildings)
L	=	Lead-based paint (in buildings)
P	=	Polychlorinated biphenyls
R	=	Radon (in buildings)
RD	=	Radionuclides/radiological issues
X	=	UXO
CWM	=	Chemical warfare material.

The EBS was conducted in accordance with the Community Environmental Response Facilitation Act (CERFA) (CERFA-Public Law 102-426) protocols and U.S. Department of Defense policy regarding contamination assessment. Record searches and reviews were

performed on all reasonably available documents from FTMC, ADEM, EPA Region IV, and Calhoun County, as well as a database search of CERCLA-regulated substances, petroleum products, and Resource Conservation and Recovery Act-regulated facilities. Available historic maps and aerial photographs were reviewed to document historic land uses. Personal and telephone interviews of past and present FTMC employees and military personnel were conducted. In addition, visual site inspections were conducted to verify conditions of specific property parcels.

Range 29 was identified as a Category 1 CERFA site, and qualified "X" for UXO. These CERFA sites are parcels where no known or recorded storage, release, or disposal (including migration) have occurred on site property, but is qualified for potential UXO. Range 29 requires additional evaluation to determine the environmental condition of the parcel.

3.0 Site-Specific Data Quality Objectives

3.1 Overview

The data quality objective (DQO) process is followed to establish data requirements. This process ensures that the proper quantity and quality of data are generated to support the decision-making process associated with the action selection for Range 29. This section incorporates the components of the DQO process described in the publication EPA 540-R-93-071 *Data Quality Objectives Process for Superfund* (EPA, 1993). The DQO process as applied to Range 29 is described in more detail in Section 4.3 of the WP. Table 3-1 provides a summary of the factors used to determine the appropriate quantity of samples, and the procedures necessary to meet the objectives of the SI and establish a basis for future action at this site.

The samples will be analyzed using EPA SW-846 methods, including Update III Methods where applicable, as presented in Chapter 4.0 in this SFSP and Table 6-1 in the QAP. Data will be reported and evaluated in accordance with Corps of Engineers South Atlantic Savannah (CESAS) Level B criteria (USACE, 1994) and the stipulated requirements for the generation of definitive data (Section 3.1.2 of the QAP). Chemical data will be reported via hard copy data packages by the laboratory using Contract Laboratory Program-like forms, along with electronic copies. These packages will be validated in accordance with EPA National Functional Guidelines by Level III criteria.

3.2 Data Users and Available Data

The available data, presented in Table 3-1, related to the SI at Range 29, have been used to formulate a site-specific conceptual model. This conceptual model was developed to support the development of this SFSP, which is necessary to meet the objectives of these activities and to establish a basis for future action at the site. The data users for the data and information generated during field activities are primarily EPA, USACE, ADEM, FTMC, and the USACE supporting contractors. This SFSP, along with the necessary companion documents, has been designed to provide the regulatory agencies with sufficient detail to reach a determination as to the adequacy of the scope of work. The program has also been designed to provide the level of defensible data and information required to confirm or rule out the existence of residual chemical contamination in site media.

Table 3-1

Summary of Data Quality Objectives
Site Investigation
Range 29, Former Weapons Demonstration Range, Parcel 87Q-X,
Former Rifle Ranges, Parcels 110Q and 111Q,
and Former Impact Area, Parcel 239Q-X
Fort McClellan, Calhoun County, Alabama

Potential Data Users	Available Data	Conceptual Site Model	Media of Concern	Data Uses and Objectives	Data Types[a, b]	Analytical Level	Data Quantity
EPA, ADEM USACE, DOD FTMC, IT Corporation Other contractors, and possible future land users	None	Contaminant Source Former Ranges, Parcels 110Q, 111Q and 87Q-X, and Impact Area, Parcel 239Q-X Migration Pathways Infiltration to subsurface soil, infiltration and leaching to groundwater, dust emissions and volatilization to ambient air, biotransfer to deer, and runoff and erosion to surface water and sediment Potential Receptors Groundskeeper (future), construction worker (future), recreational site user (current and future), on-site resident (future) PSSC Metals, perchlorate, and nitroexplosives	Surface soil Subsurface Soil Groundwater Surface Water Sediment	SI to confirm the presence or absence of contamination in the site media Definitive quality data for future decision-making	Surface soil TAL Metals, Perchlorate, and Nitroexplosives	Definitive data in CESAS Level B data packages	30 direct-push soil samples + QC
					Subsurface Soil TAL Metals, Perchlorate, and Nitroexplosives	Definitive data in CESAS Level B data packages	30 direct-push soil samples + QC
					Groundwater TAL Metals, Perchlorate, and Nitroexplosives	Definitive data in CESAS Level B data packages	20 groundwater samples + QC
					Surface Water TAL Metals, Perchlorate, and Nitroexplosives	Definitive data in CESAS Level B data packages	8 surface water samples + QC
					Sediment TAL Metals, Perchlorate, and Nitroexplosives. TOC, grain size	Definitive data in CESAS Level B data packages	8 sediment samples + QC

[a]A full suite of analytes will be collected for a soil and groundwater sample location downgradient of the potential fill area as well as a soil and groundwater location in the potential fill area. Chemical analyses for this location will include volatiles, semivolatiles, chlorinated pesticides, polyaromatic hydrocarbons, organophosphorus pesticides, chlorinated herbicides, metals, perchlorate and nitroexplosives.
[b]The samples collected for the weapons clearing area will include volatiles.

ADEM - Alabama Department of Environmental Management.
CESAS - Corps of Engineers South Atlantic Savannah.
DOD - U.S. Department of Defense.
EPA - U.S. Environmental Protection Agency.
FTMC - Fort McClellan.
PSSC - Potential site-specific chemical.
QC - Quality control.
SI - Site inspection.
TAL - Target Analyte List.
TOC - Total organic carbon.
USACE - U.S. Army Corps of Engineers.

3.3 Conceptual Site Exposure Model

The conceptual site exposure model (CSEM) provides the basis for identifying and evaluating potential risks to human health in the risk assessment. The CSEM includes receptors and potential exposure pathways appropriate to all plausible scenarios. The CSEM facilitates consistent and comprehensive evaluation of risk to human health through graphically presenting all possible exposure pathways, including sources, release and transport pathways, and exposure routes. In addition, the CSEM helps to ensure that potential pathways are not overlooked. The elements of a complete exposure pathway and CSEM are:

- Source (i.e., contaminated environmental) media
- Contaminant release mechanisms
- Contaminant transport pathways
- Receptors
- Exposure pathways.

Contaminant release mechanisms and transport pathways are not relevant for direct receptor contact with a contaminated source medium.

Primary contaminant releases are unknown, but were probably limited to contaminants that entered surface soil and potentially buried material. Potential contaminant transport pathways include infiltration and leaching to subsurface soil and groundwater, dust emissions, biotransfer to deer through browsing, surface water runoff, and erosion to surface water and sediment.

With the exception of a trespasser, there are no plausible receptors with the current land use. The site is currently not in use. Access is restricted by the fence around the perimeter of the Base, and most of the site is undeveloped. Signs are posted at the site indicating that the area is restricted and the danger of UXO. The site is currently not maintained in any fashion. The streams on site are too small to support fish and hunting is not feasible because access is restricted. It is possible that an individual could circumvent the perimeter fence on the base, ignore the warning signs, and wander into the area. Therefore, the recreational site user, representing any individual that gains unauthorized access to the site, is the only receptor evaluated under current conditions. Potential receptors considered, but not included under current land-use scenarios, are the:

- ***Groundskeeper.*** The site is not currently maintained by a groundskeeper, nor is there any regular activity that would justify analyzing a site worker regularly exposed to surface soil.

- ***Construction Worker.*** The site is unused, and no development or construction is occurring.

- ***Resident.*** The site is not currently used for residential purposes.

Future land-use is designated as "passive recreational," which may include hunting. The site may not be deemed safe for public access until remediation has been completed because of the potential for UXO (FTMC, 1997). This site is not expected to ever be used for residential purposes. There are not expected to be any construction activities at this site in the future. There are no underground utilities at the site that would require maintenance, nor is it expected that any would be installed on the site for the expected future land use. Plausible future land-use receptor scenarios in the CSEM include:

- ***Resident.*** Although the site is not expected to be developed for residential purposes, the residential scenario is considered in order to provide information for the project manager and regulators.

- ***Groundskeeper.*** The site may have areas that will need to be maintained.

- ***Construction Worker.*** Although it is highly unlikely that any construction activities will take place or any utility lines will be installed at this site, the construction worker is evaluated in the future scenario to account for any scenario that might result in short-term exposure to subsurface soil.

- ***Recreational Site User.*** The recreational site user is evaluated because the site is expected to be used for passive recreational purposes. User exposure to sediment and surface water will be evaluated. Fishing will not be included as a pathway because the streams on site are too small to support fish. Hunting will be included as a potential exposure pathway because the site is currently wooded and hunting could be a potential future use of the site.

A summary of relevant contaminant release and transport mechanisms, source and exposure media, and receptors and exposure pathways for this site is provided in Table 3-1 and Figure 3-1.

3.4 Decision-Making Process, Data Uses, and Needs

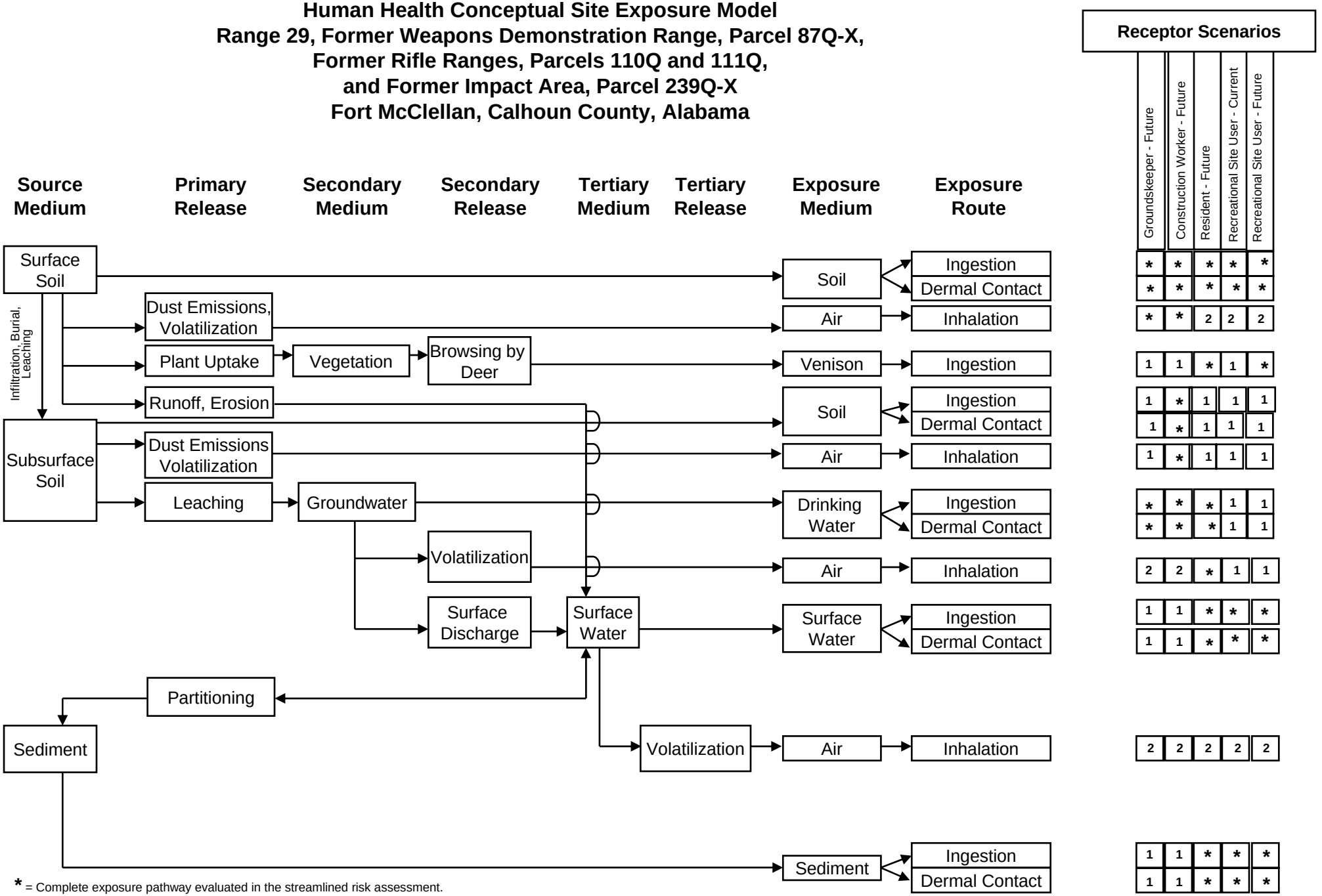
The decision-making process consists of a seven-step process that is presented in detail in Section 4.3 of the WP and will be followed during the SI at Range 29. Data uses and needs are summarized in Table 3-1.

3.4.1 Risk Evaluation

Confirmation of contamination at Range 29, will be based on using EPA definitive data with CESAS Level B data packages to determine whether or not PSSCs are detected in site media.

Figure 3-1

Human Health Conceptual Site Exposure Model
Range 29, Former Weapons Demonstration Range, Parcel 87Q-X, Former Rifle Ranges, Parcels 110Q and 111Q, and Former Impact Area, Parcel 239Q-X
Fort McClellan, Calhoun County, Alabama



* = Complete exposure pathway evaluated in the streamlined risk assessment.
1 = Incomplete exposure pathway.
2 = Although theoretically complete, this pathway is judged to be insignificant and is not evaluated in the streamlined risk assessment.

KN\4040\Range29\fig3-1\5-15-00\11:53

Detected site chemical concentrations will be compared to site-specific screening levels developed in the *Final Human Health and Ecological Screening Values and PAH Background Summary Report* (IT, 2000b). Definitive data will be adequate for confirming the presence of site contamination and for supporting a feasibility study and risk assessment.

Assessment of potential ecological risk associated with sites or parcels (e.g., surface water and sediment sampling, specific ecological assessment methods, etc.) will be addressed in accordance with the procedures in the WP.

3.4.2 Data Types and Quality

Surface soil, subsurface soil, groundwater, surface water, and sediment will be sampled and analyzed to meet the objectives of the SI at Range 29. Quality assurance/quality control (QA/QC) samples will be collected for all sample types as described in Chapter 4.0 of this SFSP. Samples will be analyzed by EPA-approved SW-846 Methods Update III, where available; comply with EPA definitive data requirements; and be reported using hard copy data packages. In addition to meeting the quality needs of this SI, data analyzed at this level of quality are appropriate for all phases of site characterization, remedial investigation, and risk assessment.

3.4.3 Precision, Accuracy, and Completeness

Laboratory requirements of precision, accuracy, and completeness for this SI are provided in Section 9.0 of the QAP.

4.0 Field Activities

4.1 UXO Survey Requirements and Utility Clearances

Range 29 falls within the "Possible Explosive Ordnance Impact Area" shown on Plate 10 of the FTMC archive search report maps (USACE, 1999a). Therefore, IT will conduct UXO avoidance activities, including surface sweeps and downhole surveys of soil borings.

4.1.1 Surface UXO Survey

A UXO sweep will be conducted over areas that will be included in the sampling and surveying activities to identify UXO on or near the surface that may present a hazard to on-site workers during field activities. Hand-held, low-sensitivity magnetometers will be used to locate surface and shallow-buried metal objects. UXO located on the surface will be identified and conspicuously marked for each avoidance. Subsurface metallic anomalies will not be disturbed, and will also be marked for easy avoidance. UXO personnel requirements, procedures, and detailed descriptions of the geophysical equipment to be used are provided in Chapter 4.0 and Appendix E of the approved SAP (IT, 2000a). Additionally, the site-specific UXO safety plan attachment has been written in conjunction with Appendix E, Installation-Wide Ordnance and Explosives Management Plan for Support of Hazardous, Toxic, Radiological Waste Activities and Construction Activities (IT, 2000a) as a necessary measure for UXO avoidance. The site-specific UXO safety plan attachment is necessary due to the extreme UXO hazards observed at Range 29.

4.1.2 Downhole UXO Survey

During the soil boring and downhole sampling, downhole UXO surveys will be performed to determine if buried metallic objects are present. UXO monitoring, as described in Chapter 4.0 of the SAP (IT, 2000a), will continue until undisturbed soils are encountered or the borehole has been advanced to 12 feet below ground surface, whichever is reached first.

4.1.3 Utility Clearances

After the UXO surface survey has cleared the area to be sampled and prior to performing any intrusive sampling, a utility clearance will be performed at locations where soil and groundwater samples will be collected, using the procedure outlined in Section 4.2.6 of the SAP (IT, 2000a). The site manager will mark the proposed locations with stakes, coordinate with the local utility companies to clear the proposed locations for utilities, and obtain digging permits. Once the locations are approved (for both UXO and utility avoidance) for intrusive sampling, the stakes will be labeled as cleared.

4.2 Environmental Sampling

The environmental sampling program at Range 29 includes the collection of surface soil, subsurface soil, groundwater, surface water, and sediment samples for chemical analyses. These samples will be collected and analyzed to provide data for characterizing the site to determine the environmental condition of the site and any further action to be conducted at the site. Additionally, samples will be collected from environmental media in locations that will assist in the assessment of potential ecological impacts resulting from activities at the site.

4.2.1 Surface Soil Sampling

Surface soil samples will be collected from 30 soil locations at Range 29.

4.2.1.1 Sample Locations and Rationale

The surface soil sampling rationale is listed in Table 4-1. Proposed sampling locations are shown in Figure 4-1. Surface soil sample designations and required QA/QC sample requirements are summarized in Table 4-2. The final soil boring sampling locations will be determined in the field by the on-site geologist, based on actual field conditions.

4.2.1.2 Sample Collection

Surface soil samples will be collected from the upper 1 foot of soil by direct-push methodology as specified in Section 4.7.1.1 of the SAP (IT, 2000a). Collected soil samples will be screened using a photoionization detector (PID) in accordance with Section 4.15 of the SAP. Surface soil samples will be screened for information purposes only, and not to select samples for analysis. Sample containers, sample volumes, preservatives, and holding times for the analyses required in this SFSP are listed in Section 5.0, Table 5-1, of the QAP. Sample documentation and chain-of-custodies will be recorded as specified in Section 4.13 of the SAP. The samples will be analyzed for the parameters listed in Section 4.5 of this SFSP.

4.2.2 Subsurface Soil Sampling

Subsurface soil samples will be collected from the 30 soil borings installed at Range 29.

4.2.2.1 Sample Locations and Rationale

Subsurface soil samples will be collected from the soil borings proposed on Figure 4-1. The subsurface soil sampling rationale is listed in Table 4-1. Subsurface soil samples to be collected are listed in Table 4-2. The final soil boring sampling locations will be determined in the field by the on-site geologist, based on actual field observations and utility clearance results.

Table 4-1

Sampling Locations and Rationale
Range 29, Former Weapons Demonstration Range, Parcel 87Q-X,
Former Rifle Ranges, Parcels 110Q and 111Q,
and Former Impact Area, Parcel 239Q-X
Fort McClellan, Calhoun County, Alabama

Sample Location	Sample Media	Sample Location Rationale
HR-87Q-MW01	Surface soil, subsurface soil, and groundwater	Soil boring and monitoring well for surface, subsurface soil, and groundwater samples to be placed on the western end of Parcel 87Q-X approximately 20 feet east of the firing line. Sample data will indicate if contaminant releases into the environment have occurred from use of this area at the firing line and if contaminated media exists at this site. The monitoring well location will be used to establish a local groundwater flow direction and site-specific geology, and provide information on groundwater quality in the residuum aquifer. Soil sample data will also be used to assess potential impacts to terrestrial biota that might utilize the site for food and/or habitat purposes.
HR-87Q-MW02	Surface soil, subsurface soil, and groundwater	Soil boring and monitoring well for surface, subsurface soil, and groundwater samples to be placed on the western end of Parcel 87Q-X approximately 40 feet east of the firing line. Sample data will indicate if contaminant releases into the environment have occurred from use of this area at the firing line and if contaminated media exists at this site. The monitoring well location will be used to establish a local groundwater flow direction and site-specific geology, and provide information on groundwater quality in the residuum aquifer. Soil sample data will also be used to assess potential impacts to terrestrial biota that might utilize the site for food and/or habitat purposes.
HR-87Q-MW03	Surface soil, subsurface soil, and groundwater	Soil boring and monitoring well for surface, subsurface soil, and groundwater samples to be placed at the west end of Parcel 111Q near what is believed a former firing line. Sample data will indicate if contaminant releases into the environment have occurred from use of this area and if contaminated media exists at this site. The monitoring well location will be used to establish a local groundwater flow direction and site-specific geology, and provide information on groundwater quality in the residuum aquifer. Soil sample data will also be used to assess potential impacts to terrestrial biota that might utilize the site for food and/or habitat purposes.
HR-87Q-MW04	Surface soil, subsurface soil, and groundwater	Soil boring and monitoring well for surface, subsurface soil, and groundwater samples to be placed at the west end of Parcel 111Q at what is believed a potential firing line. Sample data will indicate if contaminant releases into the environment have occurred from use of this area and if contaminated media exists at this site. The monitoring well location will be used to establish a local groundwater flow direction and site-specific geology, and provide information on groundwater quality in the residuum aquifer. Soil sample data will also be used to assess potential impacts to terrestrial biota that might utilize the site for food and/or habitat purposes.
HR-87Q-MW05	Surface soil, subsurface soil, and groundwater	Soil boring and monitoring well for surface, subsurface soil, and groundwater samples to be placed at the southern portion of the Ordnance Impact Area located near the middle of the site. Sample data will indicate if contaminant releases into the environment have occurred from the impact of ordnance from previous, extensive use of this area and if contaminated media exists at this site. The monitoring well location will be used to establish a local groundwater flow direction and site-specific geology, and provide information on groundwater quality in the residuum aquifer. Soil sample data will also be used to assess potential impacts to terrestrial biota that might utilize the site for food and/or habitat purposes.
HR-87Q-MW06	Surface soil, subsurface soil, and groundwater	Soil boring and monitoring well for surface, subsurface soil, and groundwater samples to be placed at the southern portion of the Ordnance Impact Area located near the middle of the site. Sample data will indicate if contaminant releases into the environment have occurred from the impact of ordnance from previous, extensive use of this area and if contaminated media exists at this site. The monitoring well location will be used to establish a local groundwater flow direction and site-specific geology, and provide information on groundwater quality in the residuum aquifer. Soil sample data will also be used to assess potential impacts to terrestrial biota that might utilize the site for food and/or habitat purposes.
HR-87Q-MW07	Surface soil, subsurface soil, and groundwater	Soil boring and monitoring well for surface, subsurface soil, and groundwater samples to be placed at the northern portion of the Ordnance Impact Area located near the middle of the site. Sample data will indicate if contaminant releases into the environment have occurred from the impact of ordnance from previous, extensive use of this area and if contaminated media exists at this site. The monitoring well location will be used to establish a local groundwater flow direction and site-specific geology, and provide information on groundwater quality in the residuum aquifer. Soil sample data will also be used to assess potential impacts to terrestrial biota that might utilize the site for food and/or habitat purposes.
HR-87Q-MW08	Surface soil, subsurface soil, and groundwater	Soil boring and monitoring well for surface, subsurface soil, and groundwater samples to be placed at the northern portion of the Ordnance Impact Area located near the middle of the site. Sample data will indicate if contaminant releases into the environment have occurred from the impact of ordnance from previous, extensive use of this area and if contaminated media exists at this site. The monitoring well location will be used to establish a local groundwater flow direction and site-specific geology, and provide information on groundwater quality in the residuum aquifer. Soil sample data will also be used to assess potential impacts to terrestrial biota that might utilize the site for food and/or habitat purposes.

Table 4-1

Sampling Locations and Rationale
Range 29, Former Weapons Demonstration Range, Parcel 87Q-X,
Former Rifle Ranges, Parcels 110Q and 111Q,
and Former Impact Area, Parcel 239Q-X
Fort McClellan, Calhoun County, Alabama

Sample Location	Sample Media	Sample Location Rationale
HR-87Q-MW09	Surface soil, subsurface soil, and groundwater	Soil boring and monitoring well for surface, subsurface soil, and groundwater samples to be placed at the southwestern portion of Parcel 87Q-X boundary. Sample data will indicate if contaminant releases into the environment have occurred from the impact of ordnance from previous, extensive use of this area and if contaminated media exists at this site. The monitoring well location will be used to establish a local groundwater flow direction and site-specific geology, and provide information on groundwater quality in the residuum aquifer. Soil sample data will also be used to assess potential impacts to terrestrial biota that might utilize the site for food and/or habitat purposes.
HR-87Q-MW10	Surface soil, subsurface soil, and groundwater	Soil boring and monitoring well for surface, subsurface soil, and groundwater samples to be directly downgradient of the mounds located in the area of former target houses located in the center of Parcel 111Q. Sample data will indicate if contaminant releases into the environment have occurred from the impact of ordnance from previous, extensive use of this area and if contaminated media exists at this site. The monitoring well location will be used to establish a local groundwater flow direction and site-specif geology, and provide information on groundwater quality in the residuum aquifer. Soil sample data will also be used to assess potential impacts to terrestrial biota that might utilize the site for food and/or habitat purposes.
HR-87Q-MW11	Surface soil, subsurface soil, and groundwater	Soil boring and monitoring well for surface, subsurface soil, and groundwater samples to be directly downgradient of the mounds located in the area of former target houses located in the center of Parcel 111Q. Sample data will indicate if contaminant releases into the environment have occurred from the impact of ordnance from previous, extensive use of this area and if contaminated media exists at this site. The monitoring well location will be used to establish a local groundwater flow direction and site-specif geology, and provide information on groundwater quality in the residuum aquifer. Soil sample data will also be used to assess potential impacts to terrestrial biota that might utilize the site for food and/or habitat purposes.
HR-87Q-MW12	Surface soil, subsurface soil, and groundwater	Soil boring and monitoring well for surface, subsurface soil, and groundwater samples to be placed immediately downgradient of a possible fill area located at the middle of th site. Sample data will indicate if contaminant releases into the environment have occurred from the impact of ordnance from previous, extensive use of this area and if contaminated media exists at this site. The monitoring well location will be used to establish a local groundwater flow direction and site-specific geology, and provide information on groundwater quality in the residuum aquifer. Soil sample data will also be used to assess potential impacts to terrestrial biota that might utilize the site for food and/or habitat purposes.
HR-87Q-MW13	Surface soil, subsurface soil, and groundwater	Soil boring and monitoring well for surface, subsurface soil, and groundwater samples placed at the southeastern portion of Parcel 111Q. Sample data will indicate if contaminant releases into the environment have occurred from the impact of ordnance from previous, extensive use of this area and if contaminated media exists at this site. The monitoring well location will be used to establish a local groundwater flow direction and site-specific geology, and provide information on groundwater quality in the residuum aquifer. Soil sample data will also be used to assess potential impacts to terrestrial biota that might utilize the site for food and/or habitat purposes.
HR-87Q-MW14	Surface soil, subsurface soil, and groundwater	Soil boring and monitoring well for surface, subsurface soil, and groundwater samples to be placed at an area with mounds located north of the eastern end of Parcel 111Q. Sample data will indicate if contaminant releases into the environment have occurred from the impact of ordnance from previous, extensive use of this area and if contaminated media exists at this site. The monitoring well location will be used to establish a local groundwater flow direction and site-specific geology, and provide information on groundwater quality in the residuum aquifer. Soil sample data will also be used to assess potential impacts to terrestrial biota that might utilize the site for food and/or habitat purposes.
HR-87Q-MW15	Surface soil, subsurface soil, and groundwater	Soil boring and monitoring well for surface, subsurface soil, and groundwater samples to be placed in-between two areas where several mounds and trenches were observed. Sample data will indicate if contaminant releases into the environment have occurred from the impact of ordnance from previous, extensive use of this area and if contaminated media exists at this site. The monitoring well location will be used to establish a local groundwater flow direction and site-specific geology, and provide information on groundwater quality in the residuum aquifer. Soil sample data will also be used to assess potential impacts to terrestrial biota that might utilize the site for food and/or habitat purposes.

Table 4-1

Sampling Locations and Rationale
Range 29, Former Weapons Demonstration Range, Parcel 87Q-X,
Former Rifle Ranges, Parcels 110Q and 111Q,
and Former Impact Area, Parcel 239Q-X
Fort McClellan, Calhoun County, Alabama

Sample Location	Sample Media	Sample Location Rationale
HR-87Q-MW16	Surface soil, subsurface soil, and groundwater	Soil boring and monitoring well for surface, subsurface soil, and groundwater samples to be placed in an area where approximately six mounds were observed at the east end of Parcel 111Q. Sample data will indicate if contaminant releases into the environment have occurred from the impact of ordnance from previous, extensive use of this area and if contaminated media exists at this site. The monitoring well location will be used to establish a local groundwater flow direction and site-specific geology, and provide information on groundwater quality in the residuum aquifer. Soil sample data will also be used to assess potential impacts to terrestrial biota that might utilize the site for food and/or habitat purposes.
HR-87Q-MW17	Surface soil, subsurface soil, and groundwater	Soil boring and monitoring well for surface, subsurface soil, and groundwater samples to be placed in southwest corner of bullet impact area. Sample data will indicate if contaminant releases into the environment have occurred from the impact of ordnance from previous, extensive use of this area and if contaminated media exists at this site. The monitoring well location will be used to establish a local groundwater flow direction and site-specific geology, and provide information on groundwater quality in the residuum aquifer. Soil sample data will also be used to assess potential impacts to terrestrial biota that might utilize the site for food and/or habitat purposes.
HR-87Q-MW18	Surface soil, subsurface soil, and groundwater	Soil boring and monitoring well for surface, subsurface soil, and groundwater samples to be placed in the northern portion of the bullet impact area. Sample data will indicate if contaminant releases into the environment have occurred from the impact of ordnance from previous, extensive use of this area and if contaminated media exists at this site. The monitoring well location will be used to establish a local groundwater flow direction and site-specific geology, and provide information on groundwater quality in the residuum aquifer. Soil sample data will also be used to assess potential impacts to terrestrial biota that might utilize the site for food and/or habitat purposes.
HR-87Q-MW19	Surface, subsurface soil, and groundwater	Soil boring and monitoring well for surface, subsurface soil, and groundwater samples to be placed in the vicinity of the Former Weapons Cleaning Area at the west end of the site. Sample data will indicate if contaminant releases into the soil have occurred, and if contaminated media exists at this site. The monitoring well location will be used to establish a local groundwater flow direction and site-specific geology, and provide information on groundwater quality in the residuum aquifer. Soil sample data will also be used to assess potential impacts to terrestrial biota that might utilize the site for food and/or habitat purposes.
HR-87Q-MW20	Surface, subsurface soil, and groundwater	Soil boring and monitoring well for surface, subsurface soil, and groundwater samples to be placed in the area denoted as a Fill Area located at the center of the site. Sample data will indicate if contaminant releases into the soil have occurred, and if contaminated media exists at the site. The monitor well location will be used to establish a local groundwater flow direction and site-specific geology, and provide information on groundwater quality in the residuum aquifer. Soil sample data will also be used to assess potential impacts to terrestrial biota that might utilize the site for foot and/or habitat purposes.
HR-87Q-GP01	Surface and subsurface soil	Soil boring for surface and subsurface soil samples placed at the south end of the 50 meter firing line. Sample data will indicate if contaminant releases into the environment have occurred from the impact of ordnance from previous, extensive use of this area and if contaminated media exists at this site. Soil sample data will also be used to asses potential impacts to terrestrial biota that might utilize the site for food and/or habitat purposes.
HR-87Q-GP02	Surface and subsurface soil	Soil boring for surface and subsurface soil samples placed at the north end of the 50 meter firing line. Sample data will indicate if contaminant releases into the environment have occurred from the impact of ordnance from previous, extensive use of this area and if contaminated media exists at this site. Soil sample data will also be used to asses potential impacts to terrestrial biota that might utilize the site for food and/or habitat purposes.
HR-87Q-GP03	Surface and subsurface soil	Soil boring for surface and subsurface soil samples placed near the middle of the 100 meter firing line. Sample data will indicate if possible contaminant releases into the environment extends north of the firing line from previous, extensive use at this range. Soil sample data will also be used to assess potential impacts to terrestrial biota that might utilize the site for food and/or habitat purposes.
HR-87Q-GP04	Surface and subsurface soil	Soil boring for surface and subsurface soil samples placed near the middle of the 150 meter firing line. Sample data will indicate if possible contaminant releases into the environment extends east of the firing point from extensive use at this range. Soil sample data will also be used to assess potential impacts to terrestrial biota that might utilize the site for food and/or habitat purposes.
HR-87Q-GP05	Surface and subsurface soil	Soil boring for surface and subsurface soil samples placed at the north end of the 200 meter firing line, downgradient from the Ordnance Impact Area. Sample data will indicate if contaminant releases into the environment have occurred from the impact of ordnance from previous, extensive use of this area and if contaminated media exists at this site. Soil sample data will also be used to assess potential impacts to terrestrial biota that might utilize the site for food and/or habitat purposes.
HR-87Q-GP06	Surface and subsurface soil	Soil boring for surface and subsurface soil samples placed at the north end of the 200 meter firing line, downgradient from the Ordnance Impact Area. Sample data will indicate if contaminant releases into the environment have occurred from the impact of ordnance from previous, extensive use of this area and if contaminated media exists at this site. Soil sample data will also be used to assess potential impacts to terrestrial biota that might utilize the site for food and/or habitat purposes.
HR-87Q-GP07	Surface and subsurface soil	Soil boring for surface and subsurface soil samples placed at the southwest corner of the Parcel 87Q-X boundary. Sample data will indicate if contaminant releases into the environment have occurred from the impact of ordnance from previous, extensive use of this area and if contaminated media exists at this site. Soil sample data will also be used to assess potential impacts to terrestrial biota that might utilize the site for food and/or habitat purposes.
HR-87Q-GP08	Surface and subsurface soil	Soil boring for surface and subsurface soil samples placed at the southwest corner of the Parcel 87Q-X boundary. Sample data will indicate if contaminant releases into the environment have occurred from the impact of ordnance from previous, extensive use of this area and if contaminated media exists at this site. Soil sample data will also be used to assess potential impacts to terrestrial biota that might utilize the site for food and/or habitat purposes.

Table 4-1

Sampling Locations and Rationale
Range 29, Former Weapons Demonstration Range, Parcel 87Q-X,
Former Rifle Ranges, Parcels 110Q and 111Q,
and Former Impact Area, Parcel 239Q-X
Fort McClellan, Calhoun County, Alabama

Sample Location	Sample Media	Sample Location Rationale
HR-87Q-GP09	Surface and subsurface soil	Soil boring for surface and subsurface soil samples placed at the southwest corner of the Parcel 87Q-X boundary. Sample data will indicate if contaminant releases into the environment have occurred from the impact of ordnance from previous, extensive use of this area and if contaminated media exists at this site. Soil sample data will also be used to assess potential impacts to terrestrial biota that might utilize the site for food and/or habitat purposes.
HR-87Q-GP10	Surface and subsurface soil	Soil boring for surface and subsurface soil samples placed at the southwest corner of the Parcel 87Q-X boundary. Sample data will indicate if contaminant releases into the environment have occurred from the impact of ordnance from previous, extensive use of this area and if contaminated media exists at this site. Soil sample data will also be used to assess potential impacts to terrestrial biota that might utilize the site for food and/or habitat purposes.
HR-87Q-SW/SD01	Surface water and sediment	Sample location on the southeast side of Parcel 89Q-X. Sample data will also be used to assess potential impacts to aquatic biota in the waterway and other ecological receptors that may utilize the waterway for food and/or habitat purposes.
HR-87Q-SW/SD02	Surface water and sediment	Sample placed near the middle of the historic range 111Q. Sample data will indicate if contamination releases into the environmental have occurred from the impact of ordnance from previous, extensive use of this area and if contaminated media exists at this historical range. Sample data will also be used to assess potential impacts to aquatic biota in the waterway and other ecological receptors that may utilize the waterway for food and/or habitat purposes.
HR-87Q-SW/SD03	Surface water and sediment	Sample placed at the 200 meter firing line. Sample data will indicate if contamination releases into the environmental have occurred from the impact of ordnance from previous, extensive use of this area and if contaminated media exists at this range. Sample data will also be used to assess potential impacts to aquatic biota in the waterway and other ecological receptors that may utilize the waterway for food and/or habitat purposes.
HR-87Q-SW/SD04	Surface water and sediment	Sample placed at the 200 meter firing line as the surface waters would exit the firing line area. Sample data will indicate if contamination releases into the environmental have occurred from the impact of ordnance from previous, extensive use of this area and if contaminated media exists at this range. Sample data will also be used to assess potential impacts to aquatic biota in the waterway and other ecological receptors that may utilize the waterway for food and/or habitat purposes.
HR-87Q-SW/SD05	Surface water and sediment	Sample placed in the northern area of Parcel 87Q-X. Sample data will indicate if contamination releases into the environmental have occurred from the impact of ordnance from previous, extensive use of this area and if contaminated media exists at this range. Sample data will also be used to assess potential impacts to aquatic biota in the waterway and other ecological receptors that may utilize the waterway for food and/or habitat purposes.
HR-87Q-SW/SD06	Surface water and sediment	Sample placed northeast of Parcel 87Q-X. Sample data will indicate if contamination releases into the environmental have occurred from the impact of ordnance from previous, extensive use of this area and if contaminated media exists at this range. Sample data will also be used to assess potential impacts to aquatic biota in the waterway and other ecological receptors that may utilize the waterway for food and/or habitat purposes.
HR-87Q-SW/SD07	Surface water and sediment	Sample placed southwest of Range 29 at the point before the site waters meet with the South Branch of Cane Creek. Sample data will indicate if contamination releases into the environmental have occurred from the impact of ordnance from previous, extensive use of this area and if contaminated media exists at this range. Sample data will also be used to assess potential impacts to aquatic biota in the waterway and other ecological receptors that may utilize the waterway for food and/or habitat purposes.
HR-87Q-SW/SD08	Surface water and sediment	Sample placed in the surface drainage feature dividing the firing lines at Parcel 87Q-X. Sample data will indicate if contamination releases into the environmental have occurred from the impact of ordnance from previous, extensive use of this area and if contaminated media exists at this range. Sample data will also be used to assess potential impacts to aquatic biota in the waterway and other ecological receptors that may utilize the waterway for food and/or habitat purposes.

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ENGR. CHCK. BY: J. RAGSDALE
INITIATOR: J. BROWN
PROJ. MGR.: J. YACOUB
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N 1,161,500

TARGET AREA
FLOW DIRECTION
HR-87Q-SW/SD06
16 LANES WITH FOXHOLES AND SAND BAGS
FORMER TRASH STORAGE
FORMER LATRINES
FORMER MESS AND WEAPONS CLEANING AREA
HR-87Q-MW19
FORMER BREAK AREA
FORMER RANGE SHACK
FORMER CONTROL TOWER
FORMER PITS FOR POSITION
FORMER BLEACHERS
FORMER LATRINES
FIRING POINTS
HR-87Q-SW/SD08
HR-87Q-MW01
HR-87Q-GP02
HR-87Q-GP01
HR-87Q-SW/SD03
HR-87Q-MW02
HR-87Q-GP03
HR-87Q-GP05
HR-87Q-GP04
HR-87Q-GP06
HR-87Q-SW/SD04
WOODS
ORDNANCE IMPACT AREA
HR-87Q-SW/SD05
HR-87Q-MW08
HR-87Q-MW07
HR-87Q-MW06
HR-87Q-MW05
HR-87Q-SW/SD02
HR-87Q-MW04
HR-87Q-MW03
HR-87Q-GP08
HR-87Q-GP07
HR-87Q-MW09
HR-87Q-GP09
HR-87Q-GP10
HR-87Q-SW/SD07
TARGET AREA
WOODS
PARCEL 110Q
15.3 acres
TRENCHES AND MOUNDS
TARGET (TANKS AND JEEPS)
HR-87Q-MW12
HR-87Q-MW15
HR-87Q-MW18
BULLET IMPACT AREA
FILL AREA
HR-87Q-MW20
HR-87Q-MW17
SHACK
HR-87Q-MW14
NUMEROUS MOUNDS
HR-87Q-MW16
CIRCULAR BERMS 30' IN DIAMETER FILLED WITH WATER
AREA OF EARTHEN TARGET HOUSES
HR-87Q-MW11
HR-87Q-MW10
HR-87Q-MW13
HR-87Q-SW/SD01
BERM (POTENTIAL FIRING LINE)
PARCEL 239Q-X
13 acres
PARCEL 111Q
46.5 acres
PARCEL 87Q-X
182 acres
ROCKY HOLLOW ROAD
SOUTH BRANCH CANE CREEK
FLOW DIRECTION
50m
100m
150m
200m
250m
300m

SCALE
0 400 800 FEET

LEGEND

- UNIMPROVED ROADS AND PARKING
- PAVED ROADS AND PARKING
- REMOVED BUILDINGS
- TOPOGRAPHIC CONTOURS (CONTOUR INTERVAL - 5 FOOT)
- TREES / TREELINE
- PARCEL BOUNDARY
- BRIDGE
- CULVERT WITH HEADWALL
- SURFACE DRAINAGE / CULVERT
- UTILITY POLE
- MOUNDS
- CONCRETE PAD FOR FORMER POP-UP TARGETS
- PROPOSED SURFACE AND SUBSURFACE SOIL SAMPLE LOCATION
- PROPOSED GROUNDWATER, SURFACE AND SUBSURFACE SAMPLE LOCATION
- PROPOSED SURFACE WATER/SEDIMENT SAMPLE LOCATION
- IMPACT AREA

FIGURE 4-1
PROPOSED SAMPLE LOCATIONS
SITE INVESTIGATION AT RANGE 29
FORMER WEAPONS DEMONSTRATION
RANGE, PARCEL 87Q-X
FORMER RIFLE RANGES
PARCELS 110Q AND 111Q AND
FORMER IMPACT AREA
PARCEL 239Q-X

U. S. ARMY CORPS OF ENGINEERS
MOBILE DISTRICT
FORT McCLELLAN
CALHOUN COUNTY, ALABAMA
Contract No. DACA21-96-D-0018

IT CORPORATION
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Table 4-2

Surface Soil and Subsurface Soil Sample Designations and QA/QC Sample Quantities
Range 29, Former Weapons Demonstration Range, Parcel 87Q-X,
Former Rifle Ranges, Parcels 110Q and 111Q,
and Former Impact Area, Parcel 239Q-X
Fort McClellan, Calhoun County, Alabama

Sample Location	Sample Designation	Sample Depth (ft)	QA/QC Samples			Analytical Suite
			Field Duplicates	Field Splits	MS/MSD	
HR-87Q-MW01	HR-87Q-MW01-SS-HL0001-REG	0-1			HR-87Q-MW01-SS-HL0001-MS/MSD	TAL Metals, Perchlorate, and Nitroexplosives
	HR-87Q-MW01-DS-HL0002-REG	a				
HR-87Q-MW02	HR-87Q-MW02-SS-HL0003-REG	0-1	HR-87Q-MW02-SS-HL0004-FD	HR-87Q-MW02-SS-HL0005-FS		TAL Metals, Perchlorate, and Nitroexplosives
	HR-87Q-MW02-DS-HL0006-REG	a				
HR-87Q-MW03	HR-87Q-MW03-SS-HL0007-REG	0-1				TAL Metals, Perchlorate, and Nitroexplosives
	HR-87Q-MW03-DS-HL0008-REG	a				
HR-87Q-MW04	HR-87Q-MW04-SS-HL0009-REG	0-1				TAL Metals, Perchlorate, and Nitroexplosives
	HR-87Q-MW04-DS-HL0010-REG	a				
HR-87Q-MW05	HR-87Q-MW05-SS-HL0011-REG	0-1				TAL Metals, Perchlorate, and Nitroexplosives
	HR-87Q-MW05-DS-HL0012-REG	a				
HR-87Q-MW06	HR-87Q-MW06-SS-HL0013-REG	0-1	HR-87Q-MW06-SS-HL0014-FD			TAL Metals, Perchlorate, and Nitroexplosives
	HR-87Q-MW06-DS-HL0015-REG	a				
HR-87Q-MW07	HR-87Q-MW07-SS-HL0016-REG	0-1				TAL Metals, Perchlorate, and Nitroexplosives
	HR-87Q-MW07-DS-HL0017-REG	a				
HR-87Q-MW08	HR-87Q-MW08-SS-HL0018-REG	0-1				TAL Metals, Perchlorate, and Nitroexplosives
	HR-87Q-MW08-DS-HL0019-REG	a				
HR-87Q-MW09	HR-87Q-MW09-SS-HL0020-REG	0-1				TAL Metals, Perchlorate, and Nitroexplosives
	HR-87Q-MW09-DS-HL0021-REG	a				

Table 4-2

Surface Soil and Subsurface Soil Sample Designations and QA/QC Sample Quantities
Range 29, Former Weapons Demonstration Range, Parcel 87Q-X,
Former Rifle Ranges, Parcels 110Q and 111Q,
and Former Impact Area, Parcel 239Q-X
Fort McClellan, Calhoun County, Alabama

Sample Location	Sample Designation	Sample Depth (ft)	QA/QC Samples			Analytical Suite
			Field Duplicates	Field Splits	MS/MSD	
HR-87Q-MW10	HR-87Q-MW10-SS-HL0022-REG	0-1				TAL Metals, Perchlorate, and Nitroexplosives
	HR-87Q-MW10-DS-HL0023-REG	a				
HR-87Q-MW11	HR-87Q-MW11-SS-HL0024-REG	0-1				TAL Metals, Perchlorate, and Nitroexplosives
	HR-87Q-MW11-DS-HL0025-REG	a				
HR-87Q-MW12	HR-87Q-MW12-SS-HL0026-REG	0-1	HR-87Q-MW12-SS-HL0027-FD	HR-87Q-MW12-SS-HL0028-FS		TCL VOCs, TCL SVOCs, Cl Pesticides, PCBs, OP Pesticides, Cl Herbicides, TAL Metals, Perchlorate, and Nitroexplosives
	HR-87Q-MW12-DS-HL0029-REG	a				
HR-87Q-MW13	HR-87Q-MW13-SS-HL0030-REG	0-1			HR-87Q-MW13-HL0030-MS/MSD	TAL Metals, Perchlorate, and Nitroexplosives
	HR-87Q-MW13-DS-HL0031-REG	a				
HR-87Q-MW14	HR-87Q-MW14-SS-HL0032-REG	0-1				TAL Metals, Perchlorate, and Nitroexplosives
	HR-87Q-MW14-DS-HL0033-REG	a				
HR-87Q-MW15	HR-87Q-MW15-SS-HL0034-REG	0-1				TAL Metals, Perchlorate, and Nitroexplosives
	HR-87Q-MW15-DS-HL0035-REG	a				
HR-87Q-MW16	HR-87Q-MW16-SS-HL0036-REG	0-1				TAL Metals, Perchlorate, and Nitroexplosives
	HR-87Q-MW16-DS-HL0037-REG	a				
HR-87Q-MW17	HR-87Q-MW17-SS-HL0038-REG	0-1	HR-87Q-MW17-SS-HL0039-FD		HR-87Q-MW17-SS-HL0038-MS/MSD	TAL Metals, Perchlorate, and Nitroexplosives
	HR-87Q-MW17-DS-HL0040-REG	a				
HR-87Q-MW18	HR-87Q-MW18-SS-HL0041-REG	0-1				TAL Metals, Perchlorate, and Nitroexplosives
	HR-87Q-MW18-DS-HL0042-REG	a				
HR-87Q-MW19	HR-87Q-MW19-SS-HL0066-REG	0-1				VOCs, TAL Metals, Perchlorate, TCL VOCs, and Nitroexplosives
	HR-87Q-MW19-DS-HL0067-REG	a				

Table 4-2

Surface Soil and Subsurface Soil Sample Designations and QA/QC Sample Quantities
Range 29, Former Weapons Demonstration Range, Parcel 87Q-X,
Former Rifle Ranges, Parcels 110Q and 111Q,
and Former Impact Area, Parcel 239Q-X
Fort McClellan, Calhoun County, Alabama

Sample Location	Sample Designation	Sample Depth (ft)	QA/QC Samples			Analytical Suite
			Field Duplicates	Field Splits	MS/MSD	
HR-87Q-MW20	HR-87Q-MW20-SS-HL0068-REG	0-1			HR-87Q-MW20-SS-HL0068-MS/MSD	TCL VOCs, TCL SVOCs, Cl Pesticides, PCBs, OP Pesticides, Cl Herbicides, TAL Metals, Perchlorate, and Nitroexplosives
	HR-87Q-MW20-DS-HL0069-REG	a				
HR-87Q-GP01	HR-87Q-GP01-SS-HL0043-REG	0-1				TAL Metals, Perchlorate, and Nitroexplosives
	HR-87Q-GP01-DS-HL0044-REG	a				
HR-87Q-GP02	HR-87Q-GP02-SS-HL0045-REG	0-1				TAL Metals, Perchlorate, and Nitroexplosives
	HR-87Q-GP02-DS-HL0046-REG	a				
HR-87Q-GP03	HR-87Q-GP03-SS-HL0047-REG	0-1				TAL Metals, Perchlorate, and Nitroexplosives
	HR-87Q-GP03-DS-HL0048-REG	a				
HR-87Q-GP04	HR-87Q-GP04-SS-HL0049-REG	0-1				TAL Metals, Perchlorate, and Nitroexplosives
	HR-87Q-GP04-DS-HL0050-REG	a				
HR-87Q-GP05	HR-87Q-GP05-SS-HL0051-REG	0-1	HR-87Q-GP05-SS-HL0052-FD			TAL Metals, Perchlorate, and Nitroexplosives
	HR-87Q-GP05-DS-HL0053-REG	a				
HR-87Q-GP06	HR-87Q-GP06-SS-HL0054-REG	0-1				TAL Metals, Perchlorate, and Nitroexplosives
	HR-87Q-GP06-DS-HL0055-REG	a				
HR-87Q-GP07	HR-87Q-GP07-SS-HL0056-REG	0-1				TAL Metals, Perchlorate, and Nitroexplosives
	HR-87Q-GP07-DS-HL0057-REG	a				
HR-87Q-GP08	HR-87Q-GP08-SS-HL0058-REG	0-1				TAL Metals, Perchlorate, and Nitroexplosives
	HR-87Q-GP08-DS-HL0059-REG	a				

Table 4-2

Surface Soil and Subsurface Soil Sample Designations and QA/QC Sample Quantities
Range 29, Former Weapons Demonstration Range, Parcel 87Q-X,
Former Rifle Ranges, Parcels 110Q and 111Q,
and Former Impact Area, Parcel 239Q-X
Fort McClellan, Calhoun County, Alabama

Sample Location	Sample Designation	Sample Depth (ft)	QA/QC Samples			Analytical Suite
			Field Duplicates	Field Splits	MS/MSD	
HR-87Q-GP09	HR-87Q-GP09-SS-HL0060-REG	0-1	HR-87Q-GP09-SS-HL0061-FD	HR-87Q-GP09-SS-HL0062-FS		TAL Metals, Perchlorate, and Nitroexplosives
	HR-87Q-GP09-DS-HL0063-REG	a				
HR-87Q-GP10	HR-87Q-GP10-SS-HL0064-REG	0-1				TAL Metals, Perchlorate, and Nitroexplosives
	HR-87Q-GP10-DS-HL0065-REG	a				

[a] Sample depth will depend on where sufficient first water is encountered to collect a water sample.

Cl - Chlorinated.
FD - Field duplicate.
FS - Field split.
MS/MSD - Matrix spike/matrix spike duplicate.
OP - Organophosphorus.
PCB - Polychlorinated biphenyl.
QA/QC - Quality assurance/quality control.
REG - Field sample.
SVOC - Semivolatile organic compound.
TAL - Target analyte list.
TCL - Target compound list.
VOC - Volatile organic compound.

4.2.2.2 Sample Collection

Subsurface soil samples will be collected from soil borings at a depth greater than 1 foot below ground surface in the unsaturated zone. The soil borings will be advanced and soil samples collected using the direct-push sampling procedures specified in Section 4.7.1.1 of the SAP (IT, 2000a).

Soil samples will be collected continuously for the first 12 feet or until either groundwater or refusal is reached. A detailed lithogical log will be recorded by the on-site geologist for each borehole. At least one subsurface sample from each borehole will be selected for analyses. The collected subsurface soil samples will be field-screened using a PID in accordance with Section 4.15 of the SAP to measure samples exhibiting elevated readings exceeding background (readings in ambient air). Typically, the subsurface soil sample showing the highest reading (above background) will be selected and sent to the laboratory for analysis. If none of the samples indicate readings exceeding background using the PID, the deepest interval from the soil boring will be sampled and submitted to the laboratory for analyses. Subsurface soil samples will be selected for analyses from any depth interval if the on-site geologist suspects PSSCs at the interval. Site conditions such as lithology may also determine the actual sample depth interval submitted for analyses. More than one subsurface soil sample will be collected if field measurements and observations indicate a possible layer of PSSCs and/or additional sample data would provide insight to the existence of any PSSCs.

Sample documentation and chain-of-custodies will be recorded as specified in Section 4.13 of the SAP. Sample containers, sample volumes, preservatives, and holding times for the analyses required in this SFSP are listed in Section 5.0, Table 5-1 of the QAP. The samples will be analyzed for the parameters listed in Section 4.5 of this SFSP.

4.2.3 Permanent Residuum Monitoring Wells

Twenty permanent residuum monitoring wells will be installed at Range 29. The permanent residuum monitoring well locations are shown on Figure 4-1. The rationale for the monitoring well locations are presented in Table 4-1. The monitoring well boreholes will be drilled to the top of bedrock using a truck-mounted hollow-stem auger drill rig. The monitoring well casing will consist of new 2-inch inside-diameter, Schedule 40, threaded, flush-joint, polyvinyl chloride pipe. Attached to the bottom of the well casing will be a section of new threaded, flush-joint, 0.010-inch continuous wrap polyvinyl chloride well screen, approximately 10 to 20 feet long. The well will be installed so the well screen straddles the water table.

Soil samples for lithology will be collected continuously every 5 feet to the total depth of the hole during hollow-stem auger drilling to provide a detailed lithologic log. The samples will be collected for lithology using a 24-inch-long, 2-inch-or-larger-diameter, split-spoon sampler. The soil borings will be logged in accordance with American Standard for Testing and Materials Method D 2488 using the Unified Soil Classification System. The soil samples will be screened in the field using a PID. The monitoring wells will be drilled, installed, and developed as specified in Section 4.8 and Appendix C of the SAP (IT, 2000a). The exact monitoring well locations will be determined in the field by the on-site geologist, based on actual field conditions.

4.2.4 Groundwater Sampling

Groundwater samples will be collected from the 20 monitoring wells completed at Range 29, as described in Section 4.2.3.

4.2.4.1 Sample Locations and Rationale

Groundwater samples will be collected from the monitoring well locations shown on Figure 4-1. The groundwater sampling rationale is listed in Table 4-1. The groundwater sample designations, depths, and required QA/QC sample quantities are listed in Table 4-3.

4.2.4.2 Sample Collection

Prior to sampling monitoring wells, static water levels will be measured from each of the 20 monitoring wells installed at the site to define the groundwater flow in the residuum aquifer. Water level measurements will be performed as outlined in Section 4.18 of the SAP (IT, 2000a). Groundwater samples will be collected in accordance with the procedures outlined in Section 4.9.1.4 of the SAP.

Sample documentation and chain-of-custodies will be recorded as specified in Section 4.13 of the SAP. Sample containers, sample volumes, preservatives, and holding times for the analyses required in this SFSP are listed in Section 5.0, Table 5-1 of the QAP (IT, 2000a). The samples will be analyzed for the parameters listed in Section 4.5 of this SFSP.

4.2.5 Surface Water Sampling

Eight surface water samples will be collected from the drainage that flows through the site.

Table 4-3

Groundwater Sample Designations and QA/QC Sample Quantities
Range 29, Former Weapons Demonstration Range, Parcel 87Q-X,
Former Rifle Ranges, Parcels 110Q and 111Q,
and Former Impact Area, Parcel 239Q-X
Fort McClellan, Calhoun County, Alabama

Sample Location	Sample Designation	Sample Matrix	Sample Depth (ft)	QA/QC Samples			Analytical Suite
				Field Duplicates	Field Splits	MS/MSD	
HR-87Q-MW01	HR-87Q-MW01-GW-HL3001-REG	Groundwater	a				TAL Metals, Perchlorate, and Nitroexplosives
HR-87Q-MW02	HR-87Q-MW02-GW-HL3002-REG	Groundwater	a				TAL Metals, Perchlorate, and Nitroexplosives
HR-87Q-MW03	HR-87Q-MW03-GW-HL3003-REG	Groundwater	a	HR-87Q-MW03-GW-HL3004-FD			TAL Metals, Perchlorate, and Nitroexplosives
HR-87Q-MW04	HR-87Q-MW04-GW-HL3005-REG	Groundwater	a				TAL Metals, Perchlorate, and Nitroexplosives
HR-87Q-MW05	HR-87Q-MW05-GW-HL3006-REG	Groundwater	a				TAL Metals, Perchlorate, and Nitroexplosives
HR-87Q-MW06	HR-87Q-MW06-GW-HL3007-REG	Groundwater	a				TAL Metals, Perchlorate, and Nitroexplosives
HR-87Q-MW07	HR-87Q-MW07-GW-HL3008-REG	Groundwater	a				TAL Metals, Perchlorate, and Nitroexplosives
HR-87Q-MW08	HR-87Q-MW08-GW-HL3009-REG	Groundwater	a				TAL Metals, Perchlorate, and Nitroexplosives
HR-87Q-MW09	HR-87Q-MW09-GW-HL3010-REG	Groundwater	a				TAL Metals, Perchlorate, and Nitroexplosives
HR-87Q-MW10	HR-87Q-MW10-GW-HL3011-REG	Groundwater	a				TAL Metals, Perchlorate, and Nitroexplosives
HR-87Q-MW11	HR-87Q-MW11-GW-HL3012-REG	Groundwater	a				TAL Metals, Perchlorate, and Nitroexplosives
HR-87Q-MW12	HR-87Q-MW12-GW-HL3013-REG	Groundwater	a	HR-87Q-MW12-GW-HL3014-FD	HR-87Q-MW12-GW-HL3015-FS		TCL VOCs, TCL SVOCs, Cl Pesticides, PCBs, OP Pesticides, Cl Herbicides, TAL Metals, Perchlorate, and Nitroexplosives
HR-87Q-MW13	HR-87Q-MW13-GW-HL3016-REG	Groundwater	a				TAL Metals, Perchlorate, and Nitroexplosives
HR-87Q-MW14	HR-87Q-MW14-GW-HL3017-REG	Groundwater	a				TAL Metals, Perchlorate, and Nitroexplosives

Table 4-3

Groundwater Sample Designations and QA/QC Sample Quantities
Range 29, Former Weapons Demonstration Range, Parcel 87Q-X,
Former Rifle Ranges, Parcels 110Q and 111Q,
and Former Impact Area, Parcel 239Q-X
Fort McClellan, Calhoun County, Alabama

Sample Location	Sample Designation	Sample Matrix	Sample Depth (ft)	QA/QC Samples			Analytical Suite
				Field Duplicates	Field Splits	MS/MSD	
HR-87Q-MW15	HR-87Q-MW15-GW-HL3018-REG	Groundwater	a				TAL Metals, Perchlorate, and Nitroexplosives
HR-87Q-MW16	HR-87Q-MW16-GW-HL3019-REG	Groundwater	a				TAL Metals, Perchlorate, and Nitroexplosives
HR-87Q-MW17	HR-87Q-MW17-GW-HL3020-REG	Groundwater	a				TAL Metals, Perchlorate, and Nitroexplosives
HR-87Q-MW18	HR-87Q-MW18-GW-HL3021-REG	Groundwater	a				TAL Metals, Perchlorate, and Nitroexplosives
HR-87Q-MW19	HR-87Q-MW19-GW-HL3022-REG	Groundwater	a				TCL VOCs, TAL Metals, Perchlorate, and Nitroexplosives
HR-87Q-MW20	HR-87Q-MW19-GW-HL3023-REG	Groundwater	a			HR-87Q-MW20-GW-HL3023-MS/MSD	TCL VOCs, TCL SVOCs, Cl Pesticides, PCBs, OP Pesticides, Cl Herbicides, TAL Metals, Perchlorate, and Nitroexplosives

[a]Sample depth will depend on where sufficient first water is encountered to collect a water sample.

Cl - Chlorinated.
FD - Field duplicate.
FS - Field split.
MS/MSD - Matrix spike/matrix spike duplicate.
OP - Organophosphorus.
PCB - Polychlorinated biphenyl.
QA/QC - Quality assurance/quality control.
REG - Field sample.
SVOC - Semivolatile organic compound.
TAL - Target analyte list.
TCL - Target compound list.
VOC - Volatile organic compound.

4.2.5.1 Sample Locations and Rationale

The surface water sampling rationale are listed in Table 4-1. The surface water samples will be collected from the proposed locations on Figure 4-1. The surface water sample designations and required QA/QC sample requirements are listed in Table 4-4. The exact sampling locations will be determined in the field by the ecological sampler, based on drainage pathways and actual field observations.

4.2.5.2 Sample Collection

The surface water samples will be collected in accordance with the procedures specified in Section 4.9.1.3 of the SAP (IT, 2000a). Sample documentation and chain-of-custodies will be recorded as specified in Section 4.13 of the SAP. Sample containers, sample volumes, preservatives, and holding times for the analyses required in this SFSP are listed in Section 5.0, Table 5-1, of the QAP. The samples will be analyzed for the parameters listed in Section 4.5 of this SFSP.

4.2.6 Sediment Sampling

Eight sediment samples will be collected from the streams at the site. These sediment samples will be collected at the same locations as the surface water samples described in Section 4.2.5.

4.2.6.1 Sample Locations and Rationale

The proposed locations for the sediment samples are shown in Figure 4-1. Sediment sampling rationale is presented in Table 4-1. The sediment sample designation and required QA/QC sample requirements are listed in Table 4-4. The actual sediment sample points will be at the discretion of the ecological sampler, based on the drainage pathways and actual field observations.

4.2.6.2 Sample Collection

The sediment samples will be collected in accordance with the procedures specified in Section 4.9.1.2 of the SAP. Sample documentation and chain-of-custodies will be recorded as specified in Section 4.13 of the SAP. The sediment samples will be analyzed for the parameters listed in Section 4.5 of this SFSP.

4.3 Decontamination Requirements

Decontamination will be performed on sampling and nonsampling equipment to prevent cross-contamination between sampling locations. Decontamination of sampling equipment will be performed in accordance with the requirements presented in Section 4.10.1.1 of the SAP (IT,

Table 4-4

Surface Water and Sediment Sample Designations and QA/QC Sample Quantities
Range 29, Former Weapons Demonstration Range, Parcel 87Q-X,
Former Rifle Ranges, Parcels 110Q and 111Q,
and Former Impact Area, Parcel 239Q-X
Fort McClellan, Calhoun County, Alabama

Sample Location	Sample Designation	Sample Matrix	Sample Depth (ft)	QA/QC Samples			Analytical Suite
				Field Duplicates	Field Splits	MS/MSD	
HR-87Q-SW/SD01	HR-87Q-SW/SD01-SW-HL2001-REG	Surface Water	N/A			HR-87Q-SW/SD01-SW-HL2001-MS/MSD	TAL Metals, Perchnlorate, and Nitroexplosives
HR-87Q-SW/SD01	HR-87Q-SW/SD01-SD-HL1001-REG	Sediment	0-0.5				(TOC, Grain Size for sediment only)
HR-87Q-SW/SD02	HR-87Q-SW/SD02-SW-HL2002-REG	Surface Water	N/A				TAL Metals, Perchnlorate, and Nitroexplosives
HR-87Q-SW/SD02	HR-87Q-SW/SD02-SD-HL1002-REG	Sediment	0-0.5				(TOC, Grain Size for sediment only)
HR-87Q-SW/SD03	HR-87Q-SW/SD03-SW-HL2003-REG	Surface Water	N/A				TAL Metals, Perchnlorate, and Nitroexplosives
HR-87Q-SW/SD03	HR-87Q-SW/SD03-SD-HL1003-REG	Sediment	0-0.5			HR-87Q-SW/SD03-SD-HL1003-MS/MSD	(TOC, Grain Size for sediment only)
HR-87Q-SW/SD04	HR-87Q-SW/SD04-SW-HL2004-REG	Surface Water	N/A				TAL Metals, Perchnlorate, and Nitroexplosives
HR-87Q-SW/SD04	HR-87Q-SW/SD04-SD-HL1004-REG	Sediment	0-0.5				(TOC, Grain Size for sediment only)
HR-87Q-SW/SD05	HR-87Q-SW/SD05-SW-HL2005-REG	Surface Water	N/A				TAL Metals, Perchnlorate, and Nitroexplosives
HR-87Q-SW/SD05	HR-87Q-SW/SD05-SD-HL1005-REG	Sediment	0-0.5				(TOC, Grain Size for sediment only)
HR-87Q-SW/SD06	HR-87Q-SW/SD06-SW-HL2006-REG	Surface Water	N/A				TAL Metals, Perchnlorate, and Nitroexplosives
HR-87Q-SW/SD06	HR-87Q-SW/SD06-SD-HL1006-REG	Sediment	0-0.5				(TOC, Grain Size for sediment only)
HR-87Q-SW/SD07	HR-87Q-SW/SD07-SW-HL2007-REG	Surface Water	N/A				TAL Metals, Perchnlorate, and Nitroexplosives
HR-87Q-SW/SD07	HR-87Q-SW/SD07-SD-HL1007-REG	Sediment	0-0.5				(TOC, Grain Size for sediment only)
HR-87Q-SW/SD08	HR-87Q-SW/SD08-SW-HL2008-REG	Surface Water	N/A	HR-87Q-SW/SD08-SW-HL2009-FD	HR-87Q-SW/SD08-SW-HL2010-FS		TAL Metals, Perchnlorate, and Nitroexplosives
HR-87Q-SW/SD08	HR-87Q-SW/SD08-SD-HL1008-REG	Sediment	0-0.5	HR-87Q-SW/SD08-SD-HL1009-FD	HR-87Q-SW/SD08/SD-HL1010-FS		(TOC, Grain Size for sediment only)

MS/MSD - Matrix spike/matrix spike duplicate.
NA - Not applicable.
QA/QC - Quality assurance/quality control.
REG - Field sample.
TAL - Target analyte list.
TOC - Total organic carbon.

Table 4-5

Analytical Samples
Range 29, Former Weapons Demonstration Range, Parcel 87Q-X
Former Rifle Ranges, Parcels 110Q and 111Q
and Former Impact Area, Parcel 239Q-X
Fort McClellan, Calhoun County, Alabam

				Field Samples			QA/QC Samples[a]					EMAX	QA Lab
Parameters	Analysis Method	Sample Matrix	TAT Needed	No. of Sample Points	No. of Events	No. of Field Samples	Field Dups (10%)	Splits w/ QA Lab (5%)	MS/MSD (5%)	Trip Blank (1/ship)	Eq. Rinse (1/wk/matrix)	Total No. Analysis	Total No. Analysis
Former Ranges, Parcels 11Q, 111Q, and 87Q-X, and Impact Area 239Q-X: 28 water matrix samples (20 groundwater samples, 8 surface water); 68 **soil matrix samples** (30 surface soil samples, 30 subsurface soil samples, and 8 sediment samples)													
TCL VOCs	8260B	water	normal	3	1	3	1	1	1	2	1	9	2
TCL SVOCs	8270C	water	normal	2	1	2	1	1	1		1	6	1
Cl Pesticides	8081A	water	normal	2	1	2	1	1	1		1	6	1
PCBs	8082	water	normal	2	1	2	1	1	1		1	6	1
OP Pesticides	8141A	water	normal	2	1	2	1	1	1		1	6	1
Cl Herbicides	8151A	water	normal	2	1	2	1	1	1		1	6	1
Tot TAL Metals	6010B/7000	water	normal	28	1	28	3	2	2		2	37	1
Perchlorate	314	water	normal	28	1	28	3	2	2		2	37	1
Nitroexplosives	8330	water	normal	28	1	28	3	2	2		2	37	1
TCL VOCs	8260B	soil	normal	6	1	6	1	1	1		1	10	1
TCL SVOCs	8270C	soil	normal	4	1	4	1	1	1		1	8	1
Cl Pesticides	8081A	soil	normal	4	1	4	1	1	1		1	8	1
PCBs	8082	soil	normal	4	1	4	1	1	1		1	8	1
OP Pesticides	8141A	soil	normal	4	1	4	1	1	1		1	8	1
Cl Herbicides	8151A	soil	normal	4	1	4	1	1	1		1	8	1
Perchlorate	314	soil	normal	68	1	68	7	4	4		4	87	4
TAL Metals	6010B/7000	soil	normal	68	1	68	7	4	4		4	87	4
Nitroexplosives	8330	soil	normal	68	1	68	7	4	4		4	87	4
TOC	9060	soil	normal	8	1	8						8	0
Grain Size	ASTMD-421/D-422	soil	normal	8	1	8						8	0
					Subtotal:	327	42	30	30	2	30	461	30

[a]Field duplicate, QA split, and MS/MSD samples were calculated as a percentage of the field samples collected per site and were rounded to the nearest whole number.
Trip blank samples will be collected in association with water matrix samples for VOC analysis only. Assumed four field samples per day to estimate trip blanks. Equipment blanks will be collected once per event whenever sampling equipment is field decontaminated and re-used. Equipment blanks will be repeated weekly for sampling events that are anticipated to last more than 1 week. Assumed 20 field samples will be collected per week to estimate number of equipment blanks.

Ship samples to: EMAX Laboratories, Inc.
630 Maple Avenue
Torrance, California 90503
Attn: Elizabeth McIntyre
Tel: 310-618-8889
Fax: 310-618-0818

USACE Laboratory split samples are shipped to: U.S. Army Engineer District, Savannah
Environmental & Materials District
Attn: Sample Receiving
200 North Cobb Parkway
Building 400, Suite 404
Marietta, Georgia 30062
Tel: 678-354-0310

Cl - Chlorinated.
MS/MSD - Matrix spike/matrix spike duplicate.
OP - Organophosphorus.
PCB - Polychlorinated biphenyl.
QA/QC - Quality assurance/quality control.
SVOC - Semivolatile organic compound.
TAL - Target analyte list.
TAT - Turnaround time.
TCL - Target compound list.
TOC - Total organic carbon.
VOC - Volatile organic compound.

2000a). Decontamination of nonsampling equipment will be performed in accordance with the requirements presented in Section 4.10.1.2 of the SAP.

4.4 Surveying of Sample Locations

Sampling locations will be marked with pin flags, stakes, and/or flagging and will be surveyed using either global positioning system (GPS) or conventional civil survey techniques, as necessary, to obtain the required level of accuracy. Horizontal coordinates will be referenced to the U.S. State Plane Coordinate System, Alabama East Zone, North American Datum, 1983. Elevations will be referenced to the National Geodetic Vertical Datum of 1929 or the North American Vertical Datum of 1988 (soon to be established on site).

Horizontal coordinates for soil, sediment, and surface water locations will be recorded using a GPS to provide accuracy within 1 meter. Because of the need to use permanent monitoring wells to determine water levels, a higher level of accuracy is required. Monitoring wells will be surveyed to an accuracy of 0.1 foot for horizontal coordinates and 0.01 foot for elevations, using survey-grade GPS techniques and/or conventional civil survey techniques, as required. Procedures to be used for GPS surveying are described in Section 4.3 of the SAP. Conventional land survey requirements are presented in Section 4.19 of the SAP. All areas at this site must be cleared for UXO avoidance before any surveying activities will commence.

4.5 Analytical Program

Samples collected at locations specified in this chapter of this SFSP will be analyzed for the specific suites of chemicals and elements based on the history of site usage, as well as EPA, ADEM, FTMC, and USACE requirements. Target analyses for samples collected from Range 29 consist of the following list of analytical suites:

- Target analyte list metals - Method 6010B/7000
- Perchlorate – Method 314
- Nitroexplosives – Method 8330.

In addition, the sediment samples will be analyzed for the following list of parameters:

- Total organic carbon – Method 9060
- Grain size – ASTM D-421/D-422.

Target analyses for samples collected from the sample locations HR-87Q-MW12, downgradient from the possible fill area, and HR-87Q-MW20, within the boundary of the possible fill area, will consist of the following analyses:

- Target compound list volatile organic compounds - Method 5035/8260B
- Target compound list semivolatile organic compounds - Method 8270C
- Target analyte metals - Method 6010B/7000
- Polychlorinated biphenyls - Method 8082
- Chlorinated herbicides - Method 8151A
- Chlorinated pesticides - Method 8081A
- Organophosphorus pesticides - Method 8141A
- Nitroexplosives - Method 8330
- Perchlorate – Method 314.

In addition to metals, nitroexplosives and perchlorate, the analyses for HR-87Q-MW19 located in the proximity of the Weapons Clearing Area will include:

- Target compound list volatile organic compounds - Method 5035/8260B.

The samples will be analyzed using EPA SW-846 methods, including Update III Methods where applicable, as presented in Table 4-5 in this SFSP and Table 6-1 in the QAP. Data will be reported and evaluated in accordance with CESAS Level B criteria (USACE, 1994) and the stipulated requirements for the generation of definitive data (Section 3.1.2 of the QAP). Chemical data will be reported via hard copy data packages by the laboratory using Contract Laboratory Program-like forms along with electronic copies. These packages will be validated in accordance with EPA National Functional Guidelines by Level III criteria.

4.6 Sample Preservation, Packaging, and Shipping

Sample preservation, packaging, and shipping will follow the procedures specified in Section 4.13.2 of the SAP (IT, 2000a). Completed analysis request/chain-of-custody records will be secured and included with each shipment of coolers to:

Attn: Elizabeth McIntyre
EMAX Laboratories, Inc.
630 Maple Avenue
Torrance, California 90503
Telephone: (310) 618-8889.

QA split samples collected for the USACE laboratory will be shipped to the following address:

U.S. Army Engineer District, Savannah
Environmental & Materials Unit
Attn: Sample Receiving
200 North Cobb Parkway
Building 400, Suite 404
Marietta, Georgia 30062
Telephone: (678) 354-0310.

4.7 Investigation-Derived Waste Management

Management and disposal of the investigation-derived wastes (IDW) will follow procedures and requirements as described in Appendix D of the SAP (IT, 2000a). The IDW expected to be generated at Range 29 will include decontamination fluids, drill cuttings, and disposable personal protective equipment. The IDW will be staged in the fenced area surrounding Buildings 335 and 336 while awaiting final disposal.

4.8 Site-Specific Safety and Health

Health and safety requirements for this SI are provided in the SSHP attachment for Range 29. The SSHP attachment will be used in conjunction with the installation-wide safety and health plan. Additionally, the site-specific UXO safety plan attachment has been prepared as a necessary measure for UXO avoidance.

5.0 Project Schedule

The project schedule for the SI activities will be provided by the IT project manager to the Base Realignment and Closure Cleanup Team and will be in accordance with the installation-wide WP.

6.0 References

Environmental Science and Engineering, Inc. (ESE), 1998, ***Final Environmental Baseline Survey, Fort McClellan, Alabama***, prepared for U.S. Army Environmental Center, Aberdeen Proving Ground, Maryland, January.

Fort McClellan (FTMC), 1997, ***Fort McClellan Comprehensive Reuse Plan***, Fort McClellan Reuse and Redevelopment Authority of Alabama, prepared under contract to the Calhoun County Commission, November.

IT Corporation (IT), 2000a, ***Final Installation-Wide Sampling and Analysis Plan, Fort McClellan, Calhoun County, Alabama***, March.

IT Corporation (IT), 2000b, ***Human Health and Ecological Screening Values and PAH Background Summary Report***, March.

IT Corporation (IT), 1998, ***Final Installation-Wide Work Plan, Fort McClellan, Calhoun County, Alabama***, August.

U.S. Army Corps of Engineers (USACE), 1999a, ***Archives Search Report, Maps, Fort McClellan, Anniston, Alabama,*** July.

U.S. Army Corps of Engineers (USACE), 1999b, ***Statement of Work for Task Order CK10, Remedial Investigations(RIs) at the Chemical Warfare Material Sites, RIs at the Fuel/Training Areas, RIs at the Print Plants/Motor Pools, RIs at the Ground Scars/Boiler Plants, RI at Range 24A, Site Investigations (SIs) at the Historic Ranges, and a Groundwater Investigation at Rideout Field at Fort McClellan, Alabama,*** June.

U.S. Army Corps of Engineers (USACE), 1994, ***Requirements for the Preparation of Sampling and Analysis Plan***, Engineer Manual EM 200-1-3, September 1.

U.S. Department of Agriculture (USDA), 1961, ***Soil Survey, Calhoun County, Alabama***, Soil Conservation Service, Series 1958, No. 9, September 1961.

U.S. Environmental Protection Agency (EPA), 1993, ***Data Quality Objectives Process for Superfund, Interim Final Guidance***, EPA 540-R-93-071, September.

ATTACHMENT 1

LIST OF ABBREVIATIONS AND ACRONYMS

List of Abbreviations and Acronyms

3D	3D International Environmental Group
Abs	skin absorption
AC	hydrogen cyanide
AcB2	Anniston and Allen gravelly loams, 2 to 6 percent slopes, eroded
AcC2	Anniston and Allen gravelly loams, 6 to 10 percent slopes, eroded
AcD2	Anniston and Allen gravelly loams, 10 to 15 percent slopes, eroded
AcE2	Anniston and Allen gravelly loams, 15 to 25 percent slopes, eroded
ACGIH	American Conference of Governmental Industrial Hygienists
ADEM	Alabama Department of Environmental Management
AEL	airborne exposure limit
AL	Alabama
amb.	amber
ANAD	Anniston Army Depot
APT	armor-piercing tracer
ASP	Ammunition Supply Point
ASR	Archives Search Report
AST	aboveground storage tank
ASTM	American Society for Testing and Materials
B	analyte detected in laboratory or field blank at concentration greater than the reporting limit (and greater than zero)
BCT	BRAC Cleanup Team
BFB	bromofluorobenzene
bgs	below ground surface
bkg	background
bls	below land surface
BOD	biological oxygen demand
BRAC	Base Realignment and Closure
Braun	Braun Intertec Corporation
BTEX	benzene, toluene, ethylbenzene, and xylenes
BTOC	below top of casing
BZ	breathing zone; 3-quinuclidinyl benzilate
C	ceiling limit value
Ca	carcinogen
CCAL	continuing calibration
CCB	continuing calibration blank
CD	compact disc
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CERFA	Community Environmental Response Facilitation Act
CESAS	Corps of Engineers South Atlantic Savannah
CFC	chlorofluorocarbon
CG	cyanogen chloride
ch	inorganic clays of high plasticity
CK	carbonyl chloride
cl	inorganic clays of low to medium plasticity
Cl.	chlorinated
CLP	Contract Laboratory Program
CN	chloroacetophenone
CNB	chloroacetophenone, benzene, and carbon tetrachloride
CNS	chloroacetophenone, chloropicrin, and chloroform
COC	chain of custody
COE	Corps of Engineers
Con	skin or eye contact
CRL	certified reporting limit
CRZ	contamination reduction zone
CS	ortho-chlorobenzylidene-malononitrile
CSEM	conceptual site exposure model
ctr.	container
CWA	chemical warfare agent
CWM	chemical warfare material; clear, wide mouth
CX	dichloroformoxime
D	duplicate
DANC	decontamination agent, non-corrosive
°C	degrees Celsius
°F	degrees Fahrenheit
DDT	dichlorodiphenyltrichloroethane
DEP	depositional soil
DI	deionized
DIMP	di-isopropylmethyiphosphonate
DMMP	dimethylmethylphosphonate
DOD	U.S. Department of Defense
DP	direct-push
DPDO	Defense Property Disposal Office
DQO	data quality objective
DRMO	Defense Reutilization and Marketing Office
DRO	diesel range organics
DS	deep (subsurface) soil
DS2	Decontamination Solution Number 2
E&E	Ecology and Environment, Inc.
EBS	environmental baseline survey
Elev.	elevation
EM	electromagnetic
EM31	Geonics Limited EM31 Terrain Conductivity Meter
EM61	Geonics Limited EM61 High-Resolution Metal Detector
EOD	explosive and ordnance disposal
EODT	explosive and ordnance disposal team
EPA	U.S. Environmental Protection Agency
EPC	exposure point concentration
EPIC	Environmental Photographic Interpretation Center
ER	equipment rinsate
ESE	Environmental Science and Engineering, Inc.
ESV	ecological screening value
Exp.	explosives
E-W	east to west
EZ	exclusion zone
FB	field blank
FD	field duplicate
FedEx	Federal Express, Inc
FFE	field flame expedient
Fil	filtered
Flt	filtered
FMP 1300	Former Motor Pool 1300
Frtn	fraction
FS	field split
ft	feet
ft/ft	feet per foot
FTA	Fire Training Area
FTMC	Fort McClellan
g	gram
G-856	Geometrics, Inc. G-856 magnetometer
G-858G	Geometrics, Inc. G-858G magnetic gradiometer
gal	gallon
gal/min	gallons per minute
GB	sarin
gc	clay gravels; gravel-sand-clay mixtures
GC	gas chromatograph
GC/MS	gas chromatograph/mass spectrometer
GFAA	graphite furnace atomic absorption
gm	silty gravels; gravel-sand-silt mixtures
gp	poorly graded gravels; gravel-sand mixtures
gpm	gallons per minute
GPR	ground-penetrating radar
GPS	global positioning system
GS	ground scar
GSBP	Ground Scar Boiler Plant
GSSI	Geophysical Survey Systems, Inc.
GST	ground stain
GW	groundwater
gw	well-graded gravels; gravel-sand mixtures
HA	hand auger
HCl	hydrochloric acid
HD	distilled mustard
HDPE	high-density polyethylene
Herb.	herbicides
HNO_3	nitric acid
hr	hour
H&S	health and safety
HSA	hollow-stem auger
HTRW	hazardous, toxic, and radioactive waste
I	out of control, data rejected due to low recovery
ICAL	initial calibration
ICB	initial calibration blank
ICP	inductively-coupled plasma
ICS	interference check sample
ID	inside diameter
IDL	instrument detection limit

List of Abbreviations and Acronyms (Continued)

IDLH	immediately dangerous to life or health
IDW	investigation-derived waste
IMPA	isopropylmethyl phosphonic acid
in.	inch
Ing	ingestion
Inh	inhalation
IP	ionization potential
IPS	International Pipe Standard
IRDMIS	Installation Restoration Data Management Information System
IT	IT Corporation
ITEMS	IT Environmental Management System ™
J	estimated concentration
JeB2	Jefferson gravelly fine sandy loam, 2 to 6 percent slopes, eroded
JeC2	Jefferson gravelly fine sandy loam, 6 to 10 percent slopes, eroded
JfB	Jefferson stony fine sandy loam, 0 to 10 percent slopes have strong slopes
K	conductivity
L	lewisite; liter
LC_{50}	lethal concentration for 50 percent of population tested
LD_{50}	lethal dose for 50 percent of population tested
l	liter
LCS	laboratory control sample
LEL	lower explosive limit
LT	less than the certified reporting limit
max	maximum
MDL	method detection limit
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
mg/m^3	milligrams per cubic meter
mh	inorganic silts, micaceous or diatomaceous fine, sandy or silt soils
MHz	megahertz
µg/g	micrograms per gram
µg/kg	micrograms per kilogram
µg/L	micrograms per liter
µmhos/cm	micromhos per centimeter
min	minimum
MINICAMS	miniature continuous air sampling system
ml	inorganic silts and very fine sands
mL	milliliter
mm	millimeter
MM	mounded material
MOGAS	motor vehicle gasoline
MPA	methyl phosphonic acid
MR	molasses residue
MS	matrix spike
mS/cm	millisiemens per centimeter
MSD	matrix spike duplicate
msl	mean sea level
MtD3	Montevallo shaly, silty clay loam, 10 to 40 percent slopes , severely eroded
mV	millivolts
MW	monitoring well
N/A	not applicable; not available
NAD	North American Datum
NAD83	North American Datum of 1983
NAVD88	North American Vertical Datum of 1988
ND	not detected
NE	no evidence
NFA	No Further Action
ng/L	nanograms per liter
NGVD	National Geodetic Vertical Datum
NIC	notice of intended change
NIOSH	National Institute for Occupational Safety and Health
No.	number
NOAA	National Oceanic and Atmospheric Administration
NR	not requested
ns	nanosecond
N-S	north to south
nT	nanotesla
NTU	nephelometric turbidity unit
O&G	oil and grease
OD	outside diameter
OE	ordnance and explosives
oh	organic clays of medium to high plasticity
ol	organic silts and organic silty clays of low plasticity
OP	organophosphorus
OSHA	Occupational Safety and Health Administration
OWS	oil/water separator
oz	ounce
PAH	polynuclear aromatic hydrocarbon
Pb	lead
PCB	polychlorinated biphenyl
PCE	perchloroethene
PDS	Personnel Decontamination Station
PEL	permissible exposure limit
Pest.	pesticide
PG	professional geologist
PID	photoionization detector
PkA	Philo and Stendal soils local alluvium, 0 to 2 percent slopes
POL	petroleum, oils, and lubricants
PP	peristaltic pump
ppb	parts per billion
PPE	personal protective equipment
ppm	parts per million
PPMP	Print Plant Motor Pool
ppt	parts per thousand
PSSC	potential site-specific chemical
pt	peat or other highly organic silts
PVC	polyvinyl chloride
QA	quality assurance
QA/QC	quality assurance/quality control
QAP	installation-wide quality assurance plan
QC	quality control
QST	QST Environmental Inc.
qty	quantity
Qual	qualifier
R	rejected
RCRA	Resource Conservation and Recovery Act
RDX	cyclonite
ReB3	Rarden silty clay loams
REG	field sample
REL	recommended exposure limit
RFA	request for analysis
RI	remedial investigation
RL	reporting limit
RPD	relative percent difference
RRF	relative response factor
RSD	relative standard deviation
RTK	real-time kinematic
SAD	South Atlantic Division
SAE	Society of Automotive Engineers
SAIC	Science Applications International Corporation
SAP	installation-wide sampling and analysis plan
sc	clayey sands; sand-clay mixtures
Sch.	schedule
SD	sediment
SDG	sample delivery group
SDZ	safe distance zone; surface danger zone
SEMS	Southern Environmental Management & Specialties
SFSP	site-specific field sampling plan
SGF	standard grade fuels
SHP	installation-wide safety and health plan
SI	site investigation
SL	standing liquid
sm	silty sands; sand-silt mixtures
SOP	standard operating procedure
sp	poorly graded sands; gravelly sands
SP	sump pump
Ss	stony rough land, sandstone series
SS	surface soil
SSC	site-specific chemical
SSHO	site safety and health officer
SSHP	site-specific safety and health plan
SSSL	site-specific screening level
STB	supertropical bleach

List of Abbreviations and Acronyms (Continued)

STEL	short-term exposure limit
STOLS	Surface Towed Ordnance Locator System®
Std. units	standard units
SU	standard unit
SVOC	semivolatile organic compound
SW	surface water
SW-846	U.S. EPA *Test Methods for Evaluating Solid Waste: Physical/Chemical Methods*
SZ	support zone
TAL	target analyte list
TAT	turn around time
TB	trip blank
TCE	trichloroethene
TCL	target compound list
TCLP	toxicity characteristic leaching procedure
TDGCL	thiodiglycol
TDGCLA	thiodiglycol chloroacetic acid
TERC	Total Environmental Restoration Contract
TIC	tentatively identified compounds
TLV	threshold limit value
TN	Tennessee
TOC	top of casing, total organic carbon
TPH	total petroleum hydrocarbons
TRADOC	U.S. Army Training and Doctrine Command
TRPH	total recoverable petroleum hydrocarbons
TWA	time weighted average
UCL	upper confidence limit
UCR	upper certified range
UJ	not detected above reporting limit; result should be estimated
USACE	U.S. Army Corps of Engineers
USAEC	U.S. Army Environmental Center
USAEHA	U.S. Army Environmental Hygiene Agency
USAMCLS	U.S. Army Chemical School
USATEU	U.S. Army Technical Escort Unit
USATHAMA	U.S. Army Toxic and Hazardous Material Agency
USCS	Unified Soil Classification System
USDA	U.S. Department of Agriculture
USEPA	U.S. Environmental Protection Agency
UST	underground storage tank
UXO	unexploded ordnance
VOA	volatile organic analyte
VOC	volatile organic compound
VOH	volatile organic hydrocarbon
VQlfr	validation qualifier
VQual	validation qualifier
VX	nerve agent (O-ethyl-S- [diisoproplaminoethyl]-methylphosphonothiolate)
Weston	Roy F. Weston, Inc.
WP	installation-wide work plan
WS	watershed
WSA	Watershed Screening Assessment
WWI	World War I
WWII	World War II
XRF	x-ray fluorescence
yd^3	cubic yards